

In This Issue—Another Packer Electrical Study

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MOTOR AGE

Vol. XLI
Number 7

PUBLISHED WEEKLY AT THE MALLERS BUILDING
CHICAGO, FEBRUARY 16, 1922

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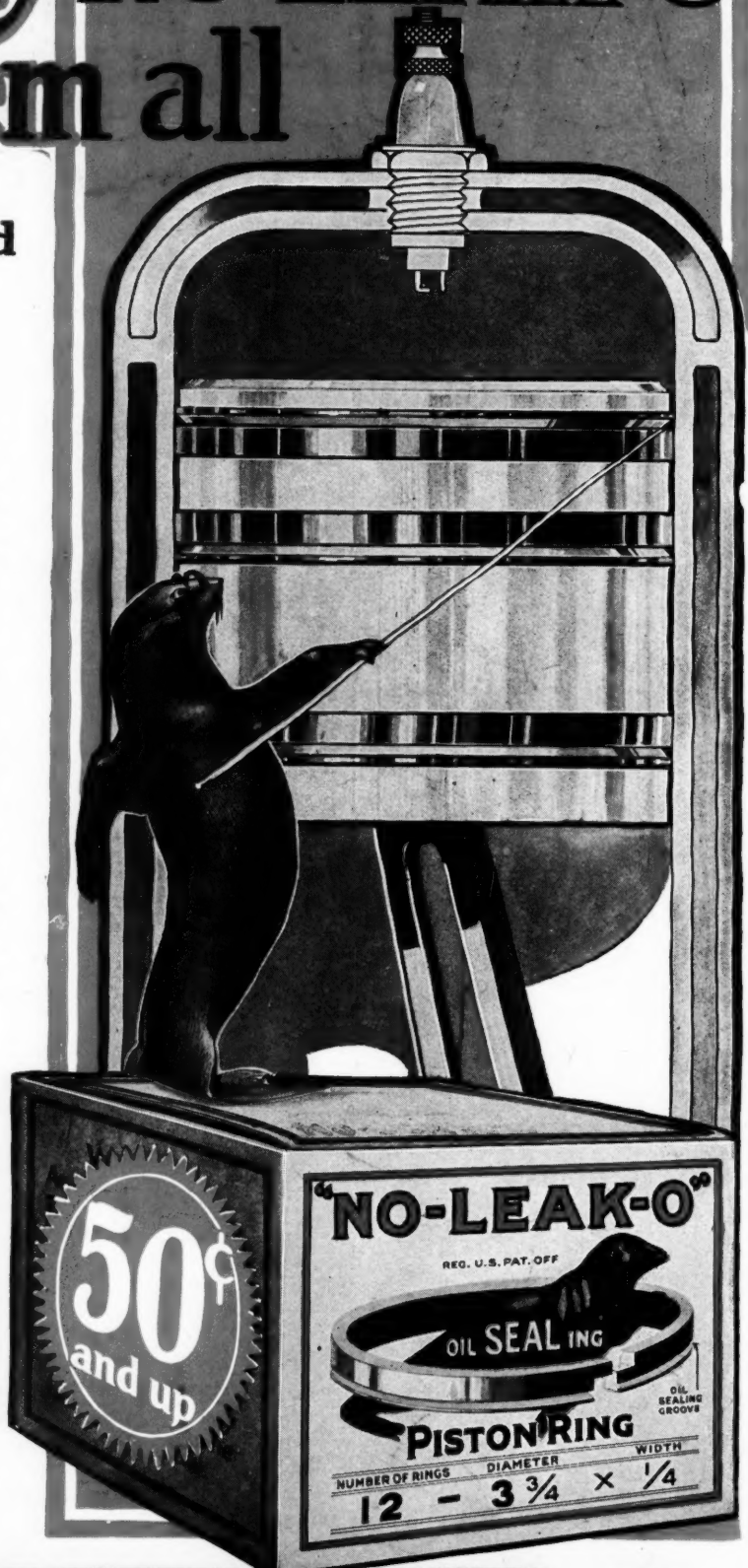
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MOTOR AGE

Published Every Thursday by
THE CLASS JOURNAL COMPANY
 MALLERS BUILDING
 59 East Madison Street, CHICAGO

Vol. XLI

February 16, 1922

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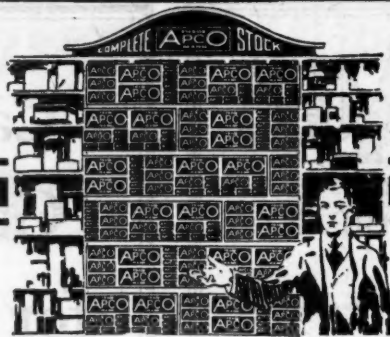
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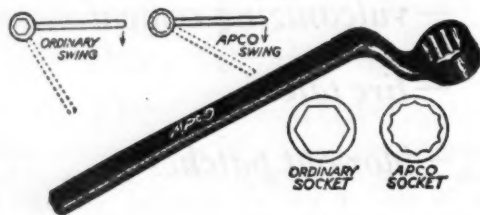
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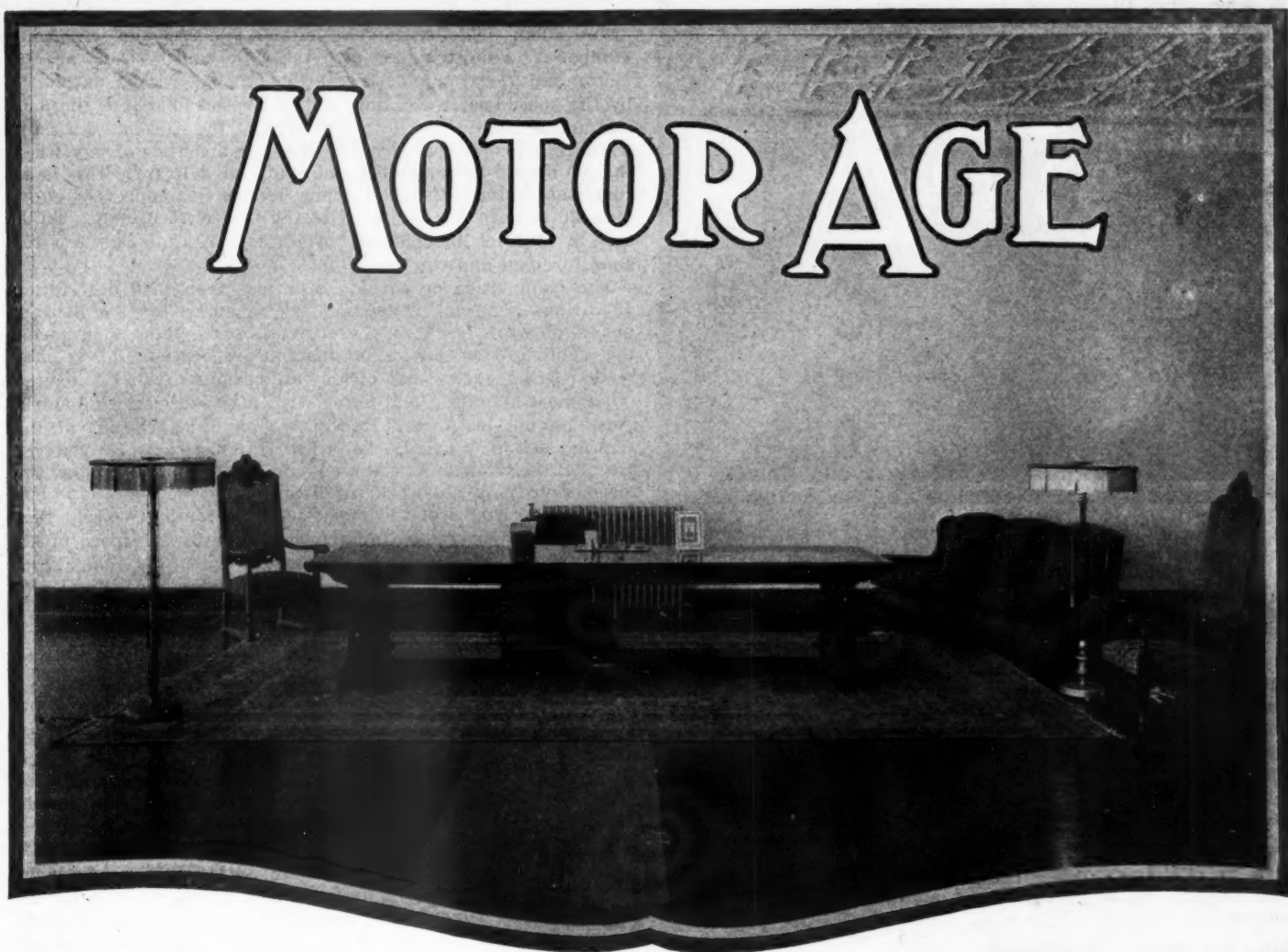
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Here is shown the reception and waiting room of the Hatcher Service Co. Contrast this with the more common places of selling service and it will not be difficult to understand why this concern is successful. It is vastly easier to intelligently sell service in an atmosphere of this kind than in one where the discriminating car owner fears to step

Where Proper Equipment Makes Service Profitable and Satisfying

THIS Is a Story of How a Well Equipped Sales and Service Company Is Making Money on Its Service. Every Machine Must Pay Dividends on the Investment

WHEN a service department is equipped to handle any kind of a job and is virtually able to turn out a new car, if necessary, customers will seek it from near and far. This is the philosophy of the Hatcher Service Co., Springfield, Ill., gained through an experience of many years.

The history of the service business so far is that those service organizations which are fully equipped with machinery and have the correct house policy, business-like methods of selling service and have a thorough understanding of the importance in realizing that the car owner is their bread and butter, are the ones which have succeeded.

Insurance companies sanction the well equipped shop. The adjuster relishes the idea of estimates put out by a concern which is in a position to know what it is talking about, and able to back up its figures with a workmanlike job. Equipment, backed by an earnest and conscientious personnel, is the word of modern day success in service station endeavor.

"It is our idea," said Henry Meyer, manager, "to make every machine we put in pay for itself, and some of ours have done this several times over. We try to get the best possible appliances for our needs, and then we make that machine work for its board and lodging."

The Hatcher company is the distributor of Dodge Brothers car in a territory made up of Sangamon, Menard and parts of



A view in the main shop. It will be noted that each man has his own vise on the bench, which extends the full length of the shop. Plenty of light is available and by parking the cars as shown, there is no interference between the men and their respective work

Christian and Macoupin counties. The territory is not large, but it lies in the midst of the Central Illinois corn belt, and, coupled with the coal industry, forms a community above the average in general business stability. The company is also a distributor in this territory for Graham Brothers' truck units and attachments, and winter and California type tops of the Rex Mfg. Co.

Twenty-seven hundred Dodge cars have been sold by this organization, in addition to over half this number of used cars. When the buying population of the territory is considered, the Hatcher company takes a high position in the selling column.

Sales and Service Department

The sales organization and the service station are conducted as separate units, and each fights its own battles and pays its own way, except that there is, of course, a well fostered spirit of co-operation between the two branches. Car salesmen are responsible for many general repair and overhauling jobs, while the service station men point to a record of many car sales resulting from their ability to keep eyes and ears open for the general benefit of the concern.

The inner workings and methods employed by the Hatcher company are not a closed book to the old client or prospective new customer. When a car comes into the receiving room, one of the inspectors meets the owner and the apparent trouble is freely discussed. If necessary, the car is taken out for a test run, with the owner as a passenger, and an attempt is made to gather as much car history as possible.

The trouble is diagnosed as completely as possible, and where the work to be done is clearly defined, a flat rate price is given. On jobs where the car may require additional attention other than what appears at the time, the customer is told that the labor charge will be so much per hour, and extra parts will cost a stated sum. There is no air of mystery about the place, and very often the customer is taken into the shop and shown the actual work being done on his car. This is an attention which is much appreciated by many people.

The Recording System

The inspector, having made his notations, takes the customer into the service office, where he dictates the work on shop order. The shop order is in triplicate. The first copy is white and remains in the service office for the alphabetical files. The second copy is yellow and accompanies the car to the department where the work is to be done. The third copy is a brown envelope of heavy paper and is retained in the office.

The job order is a valuable document and becomes the basis for the work of the entire plant. It is replete with useful information. The customer's name, address and telephone number is taken, together with the make and type of car, the motor and serial numbers and the mileage record as shown by the speedometer. A time stamp is used to record the date and actual time of the formal receipt of the car into the shop.

There is also a space to note the date and time of day when the job should be completed and ready for delivery. This is an important point with the Hatcher Service Co., and every effort is made to have the car ready at the time agreed upon. To do this, it requires the closest sort of co-operation between the shop foreman and the inspectors.

The main space on the job order is given to a description of various shop operations. There is space for ten distinct pieces of work, each numbered, with three lines to describe the contemplated job. For instance, operation No. 1 may read: Grind valves and clean out carbon.

The next operation may direct that a new upper wind-shield glass be put in, or that the side play be taken out of the steering and new spindle bolts fitted, if necessary. Whatever direction is given, it is clean-cut and decisive and enables the foreman to plan his work intelligently.

The three copies of the job order are identical, except that the envelope is arranged on the back side for a record of all requisitions used on the job, with the number of the requisition, the amount and stock number of the part with its trade description and the price of the part.

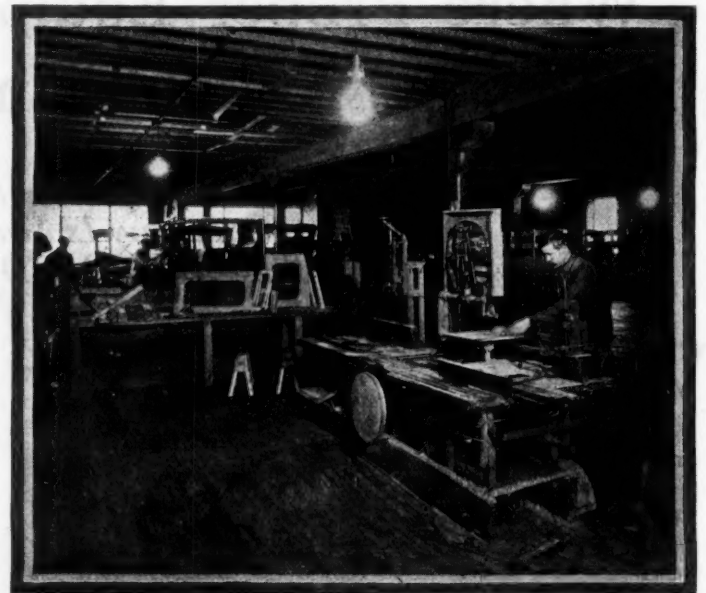
There is also a column to keep the shop time, which includes the mechanic's number, the amount of the time and its equivalent in dollars and cents. It also shows what operation the mechanic worked on.

A Complete Record of Every Job

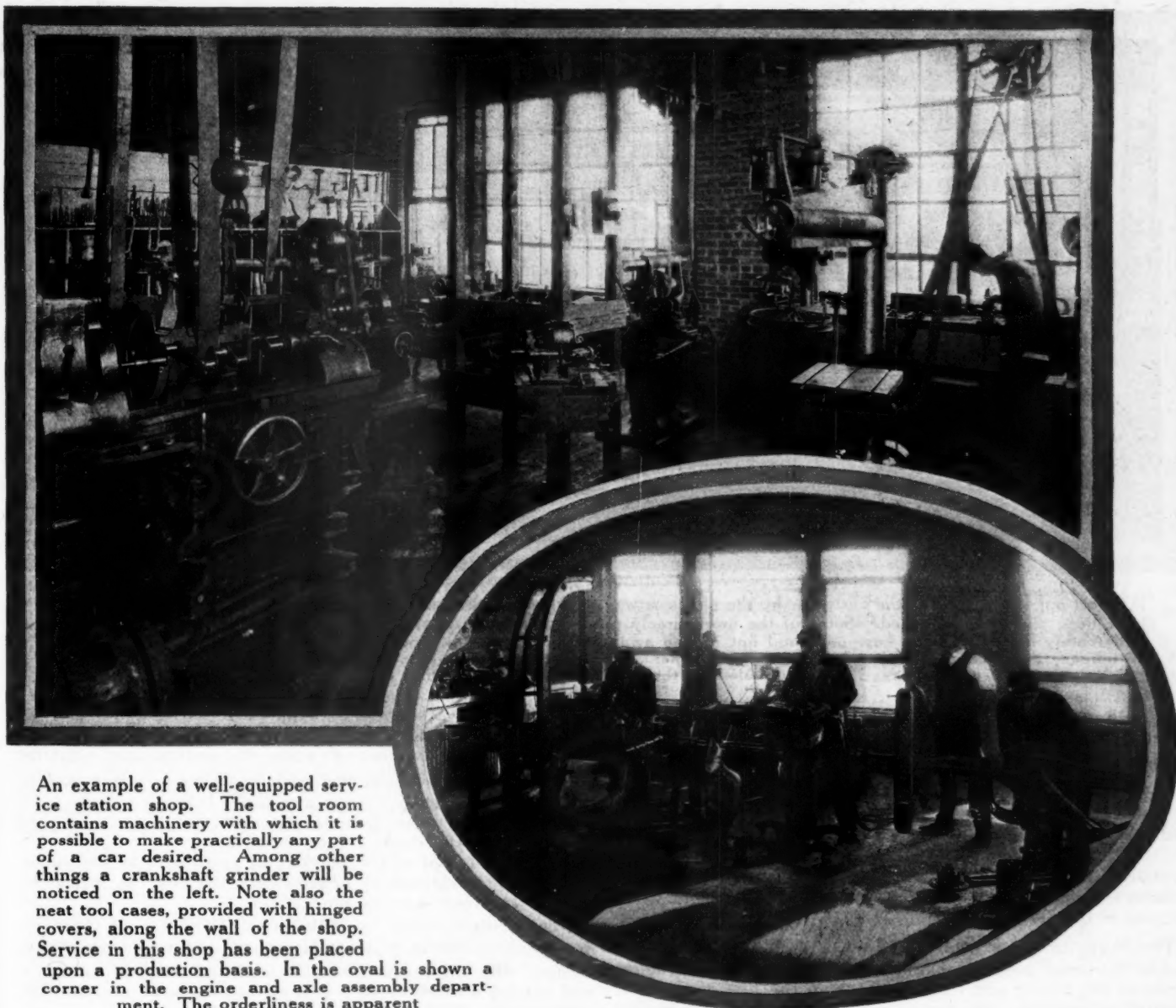
When the totals of the requisition and labor tickets are taken there is a complete record of the transaction. The customer may inspect this and is urged to do so, as it serves the purpose of an itemized bill.

All requisitions and labor tickets are kept in the envelope, and the various bookkeeping and accounting entries are made direct from it. The envelopes are kept up to the minute, as all time tickets are conveyed through a chute immediately after the mechanic stamps out on an operation, and a copy of all requisitions is sent down immediately after being filled. It is thus a log of the car's journey through the shop.

An electric freight elevator, having a capacity for two cars and equipped with safety gates, conveys the car to the shop, where the foreman consults the yellow work order and determines upon what operation to start.



In order to round out its line the company has installed a wood-working department. This makes it possible to repair bodies for trucks. As will be noted plenty of space has been allowed around the machines



An example of a well-equipped service station shop. The tool room contains machinery with which it is possible to make practically any part of a car desired. Among other things a crankshaft grinder will be noticed on the left. Note also the neat tool cases, provided with hinged covers, along the wall of the shop. Service in this shop has been placed upon a production basis. In the oval is shown a corner in the engine and axle assembly department. The orderliness is apparent

The job order stays with the car, in a leather envelope, made with a glazed face, which permits of the order being read easily without actually being handled with soiled or greasy hands.

In addition to its excellent equipment of machines and appliances, the Hatcher organization also boasts of mechanics who are specialists in certain lines of work, and these men are enabled to put in their time on operations for which they are best fitted by training and experience.

Requisitions for Parts

Where parts are necessary, the foreman dictates the requisition and signs it and the material comes from the stock room on a dumb-waiter. The requisition, upon being filled and priced in the stock room, goes at once to the office. Time slips are stamped in and out on each operation and these slips also go direct to the office.

When a job is finished, the foreman makes a notation on the yellow job order, showing, by number which mechanic was employed on each operation. These will correspond with the labor tickets already sent to the office, during the progress of the job. The yellow job order is then placed in the car and sent down to the inspector who took the job in. After being inspected and tested, the car is ready for delivery to the owner.

It is in the main shop on the third floor where one begins to realize the company's idea of equipment. The room is 60 ft. wide and 125 ft. long, without posts, the roof having a latticed-truss suspension.

The ends of the room are practically solid glass, with an abundance of windows on each side, together with several sky-lights in the room. There are 200 lineal feet of benches, made of three-inch solid maple, with individual tool lockers and clothes closets for the men. There is a vise every 12 ft.

The machines are installed at one end of the room in a screened apartment known as the "Tool Room." This department is in charge of an experienced machinist and tool maker.

This man exercises supervision over the machines, the shop tools and a sundry stock such as oils and greases, rags and various appliances manufactured in the shop, such as head-lamp tie rods, foot scrapers for installation on running boards, and salvage stock of all kinds.

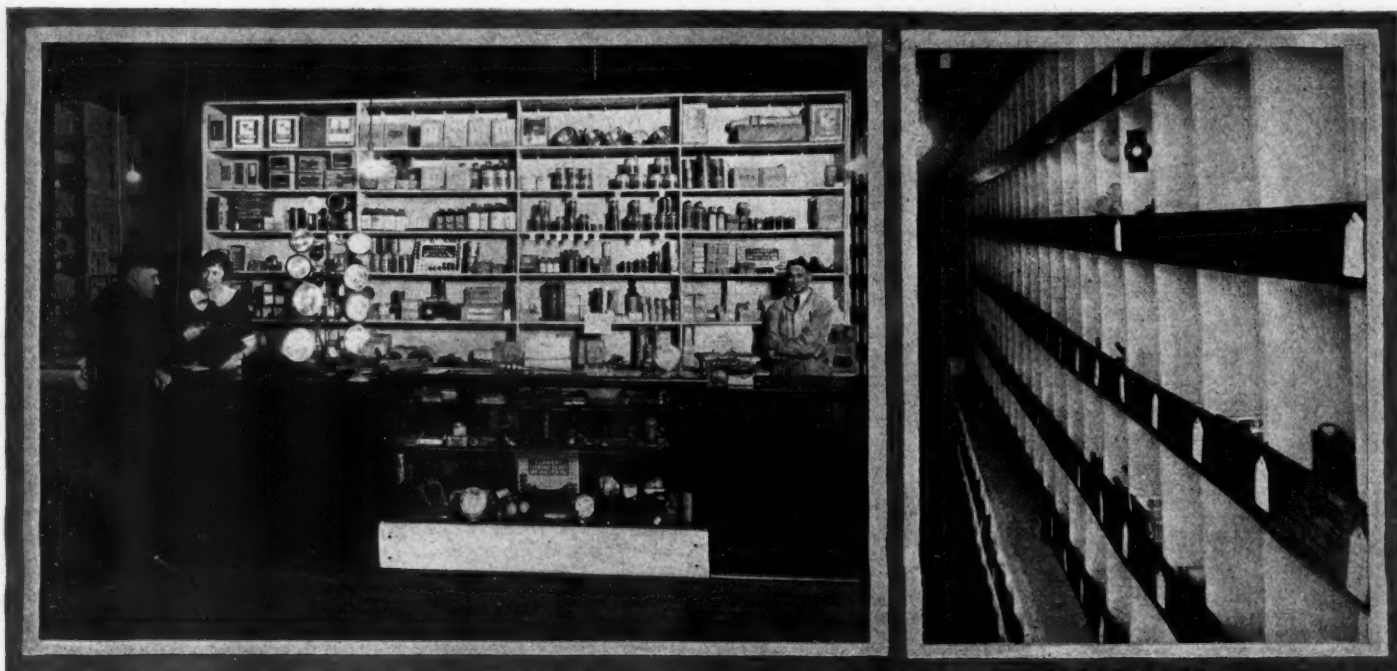
Keeping Record of Costly Tools

Tools are taken from this room by the mechanic, after he has surrendered a brass check bearing his number. The check is given to the mechanic when he brings back the tool in good order.

All material goes out of the tool room on a requisition, and one is also made out when a machine is used, showing the time spent in the use of that particular machine. A list of the principal machines in the tool room is as follows:

South Bend motor-driven lathe with a 10 ft. bed. This machine is adapted to numerous uses, such as straightening drive and propeller shafts, turning down armatures, etc.

A No. 22 Landis grinder is used for grinding pistons, piston-pins, crankshafts and reamers, or any bearing shaft. A quan-



A direct appeal is made to the customer by the effective way in which the accessory cases and counter in the stock room have been placed and stocked. Some of the more timely pieces of apparatus are placed in the show case where they can readily be seen by the customer, and not hidden away somewhere in the stock room as is often the case. Right, a section of the stock room. Note that the compartments have been painted white. This gives a neater appearance and makes it easier to identify the contents, besides affording better light

tity of large sized pistons have been cast from moulds and finished on this machine.

The Canedy-Otto radial drill in the shop has a 3½ ft. swing, and is equipped for universal re-boring jobs. Any car with a removable cylinder head can be run under this machine and the cylinders rebored without taking the block from the car. On cars of the Dodge type, the time allowed for re-boring cylinders, fitting new pistons and rings and wrist pins, all bearings taken up, and grinding valves, or a complete overhauling of the motor, is 14 hours.

The Franklin valve grinder, although a midget in size, is one of the most useful machines in the place. The mechanic removes the valves and turns them in to the tool room on a requisition and the customer is charged at the rate of 10 cts. per valve.

Hisey No. 2 milling machine cuts gears, key-ways, squares up shafts, saws iron and steel, and has a hundred uses and is of especial value in the making of special reamers and tools of various kinds.

A 14 in. Champion high speed drill, a gas oven for hardening tools, etc., a generator testing stand, together with other appliances for lighting and ignition work, completes the inventory of the larger machines in the tool room.

An interesting corner of the shop is the engine assembling department. It is here that the bearing work is done. A burning-in stand was made in the shop and gives satisfactory service.

A standard Dodge Brothers engine, with transmission, is mounted on an angle-iron frame, with gasoline tank and exhaust pipe to the outside of the building. When bearings are to be burned in, this machine having any speed forward, as well as reverse, does the work. There are also motor frames, equipped with trippers, to allow of the block being worked on from any side.

Cleanliness Plays a Big Part

Where welding work is to be done, there is a portable outfit in the tool room. Requisitions are necessary for the use of this machine the same as the stationary appliances in the tool room.

One of the noticeable features in the shop, as well as throughout the entire establishment, is the air of cleanliness.

The mechanics are urged to wear clean work clothes and the shop pays the laundry bills.

The floors and benches are clean and orderly, and a janitor puts in full time at cleaning and scrubbing. It is a serious offense in this shop to use any tools belonging to the car owner, and complaints from customers on account of misplaced tools or appliances are a rare occurrence.

The second floor of the building is given over to the upholstery and woodworking departments, the new car inspection and testing room and the stock room.

The upholstery men, or "automobile trimmers," as they prefer being called in this establishment, perform a variety of duties. Slip covers are made for tops and many other useful and salable articles such as seat covers, curtains, radiator and hood covers, wind-shield shades and carpets.

These devices are made both on order and for stock. This department also does all repair work on tops, curtains, seats, window and door fitting for closed cars. Two Singer power machines are used.

The woodworking department is equipped with a No. 30 Universal woodworker. This machine combines a planer, shaper, rip and band saws, and has a great variety of uses.

The Hatcher Company builds many special truck bodies, and the wood shop, ably supported by the blacksmith shop, turns out some very creditable jobs. The same sturdy benches found in the main shop on the floor above are in evidence here, together with an abundance of daylight.

A Paint Shop for Complete Service

A fully equipped paint shop is operated in an adjoining building, where the idea prevails that one good job is far better than a half dozen of the hit or miss kind.

The stock room occupies a space of 2,800 sq. ft. and contains 3,718 bins of various sizes, and the average value of parts and accessories carried is about \$30,000. The bins are painted pure white outside and inside, with the horizontal divisions of the racks in black.

Automobile parts are, as a rule, dirty and greasy, but this stock room is clean. An air line connecting with the compressor on the first floor, as described in *MOTOR AGE* under date of Dec. 22, runs into the stock room. Air is thus available for inflating tires, but the principal use of the air is in cleaning out bins and pigeon-holes.

The principal stock carried is, of course, for Dodge Brothers

cars, but a variety of standard parts for all machines makes this stock room many extra dollars during the year.

Requisitions come from the shop by way of the dumb-waiter, and after being filled and priced, one copy is retained. From this copy the deductions are made on the stock record cards. The requisitions are afterward assembled, original and duplicates, and are matched and compared in the main office.

Straight sales are made of both parts and accessories, and are accounted for by a triplicate sales slip. The stock room is made to pay its own way, after the manner of the other departments. Rent, light, heat, salaries and carrying charges, as well as the cost of goods, are charged against the department.

Some Stock Room Philosophy

A perpetual card inventory system is used, and all of the ordering is done from the cards, except where the article is new and has never been carried in stock. W. C. Hopper, the stock keeper, is not only a close student of general stock keeping work, but an expert automobile mechanic as well.

He has found, by experience, that it pays to have more than a superficial knowledge of an automobile to enable one to conduct a store room successfully. According to Mr. Hopper, any one can manage a stock room, if they will keep in mind the following points:

- 1—Be courteous, but firm.
- 2—Know your stock, both backward and forward.
- 3—Keep 'em outside the railing; the boss may be the worst offender, and generally is.
- 4—Admit that you are wrong (once in a while).
- 5—Make your stock cards tell the truth.
- 6—Be a crank for cleanliness and order.
- 7—Listen and read; sometimes the other fellow knows.
- 8—Have as few door keys as possible.
- 9—Keep some one trained to take your place.
- 10—Always keep in mind that stock is the same as money.

When a requisition calls for six cotter keys, don't throw in six more for good measure.

The Hatcher Service Co., following out a plan in keeping with the name adopted by the firm, strives to render service at all times. Two service trucks are always in readiness to answer calls of distress.

On one occasion not long ago, a car was towed in a distance of 85 miles. Truck owners are always given the preference in repair work and overtime service is often rendered.

The company is a distributor in this territory for Prest-O-Lite batteries and a fully equipped sales and service station is maintained. It is also an authorized station of the North East Electric, Inc., and a complete stock of lighting and ignition parts is kept.

Industry Denied Hearing By Government, Allies Self With Farmers on Bonus Tax Question

WASHINGTON, D. C., Feb. 13—Agriculture and industry have joined with the road builders of the country in a determined drive against a gasoline tax and an added motor vehicle tax proposed by members of the ways and means and finance committees as substantial sources of revenue for a soldiers' bonus. Denied hearings by Congressman Fordney, representatives of the National Automobile Chamber of Commerce and the American Automobile Assn. have turned to those who would suffer most from the imposition of these taxes, and as a result of this series of conferences a flood of protest from all sections of the country is pouring into Washington today.

According to T. C. Atkeson, Washington representative of the National Grange, more than 50 per cent of the proposed 25 cents per horsepower on motor vehicles tax and 1 per cent per gallon on gasoline would be borne by the farmers of the country, an addition which, in face of the present low price for farm commodities, would work untold harm in his opinion.

This position is substantially that assumed by the American Farm Bureau Federation, whose tax expert, H. M. McKenzie, has appeared against each of the eight points of revenue proposed.

According to officials of the A. A. A., the most serious aspect of the proposed new taxes is their effect upon the road building program. The heavy tax burdens with which motor vehicle owners are now confronted has already brought about a very considerable resistance to further taxation for road purposes in many states. The imposition of federal taxes upon the already heavy special discriminatory levies would be sufficient, in the opinion of leading highway authorities, to bring about a serious diminution in appropriations for road building in the several states, with the net result that the highway program which is just now quickening into full vigor would be retarded and millions of dol-

lars lost in added maintenance cost, which would be necessary as a result of neglect of our highways at this time.

From the standpoint of officials of the National Automobile Chamber of Commerce, the tax is unthinkable, because it is an effort to throw a burden of national obligation upon one or two industries. Beyond this, chamber officials point out that the industry is already subjected to special taxes amounting to more than \$300,000,000 annually at a time when every manufacturer is searching for ways and means of cutting even a few dollars from the cost of his product in order to widen his purchasing field.

The statement that this tax is levied because the government is returning \$100,000,000 annually to the industry for better highways is met by the conclusive statement that more than that amount is now being paid into the federal treasury in excess taxes while figures recently prepared show that motor vehicle owners of the United States are paying an annual charge of \$19 per car, while the total amount appropriated for road maintenance in this country by county, state and national authorities is only \$18.35 per car.

C. C. Hanch, chairman of the taxation committee of the National Automobile Chamber of Commerce, was unsparing in his criticism of the sources of revenue proposed to meet the bonus.

"The imposition of this tax would be the proverbial last straw," declared Hanch. "When the present excise taxes were levied it was positively stated that they were for war emergency purposes and that they would be repealed when the war was over. Instead we are now faced with further charges. It is a known fact that the purpose of the original levy was to restrict production and consumption.

"The only possible consequence of further taxes at this time will be further unemployment and the clogging of the wheels of business."



Lincoln touring car with permanent top

Twin-City Show Is

The Fighting Smile of the Northwestern Distributors

AFTER a Year of Discouragements and Slow Sales, These Men Are Back at Work Seeking to Build a New Dealer Organization to Forget the Losses of 1921 in Counting the Profits of 1922

St. Paul, Minn., Feb. 11. "YOU can't whip a man who fights and smiles," said a speaker at the National Automobile Dealers' Assn. dinner in Chicago. The Twin-City Automobile show is the smile of the automobile dealers of the northwest. You all know that they have been fighting for business for a year, and any one who visited the show half way between this city and Minneapolis this week will realize that the northwestern automotive man is one who fights and smiles.

It requires no special comment here to carry the message to you of the sales battle in the northwest last year. The Twin-Cities are, of course, the merchandising headquarters of the great grain and cattle country that extends westward to the Rockies. When farm products took the rocket fall that carried them far below other commodities in the price list, this country merely suspended buying of everything that was not acutely needed for the day. The deferred sales included, naturally, automotive equipment, for most any car will do a year longer if necessary. And so dealer organizations went to smash in a hurry.

The distributors who staged the show here last year say—and they are speaking quite frankly—that had they known what 1921 held in store for them last year they would not have staged a show. But that is hardly true. The men who fight and smile like these men do would never quit until convinced that the fundamentals of their business were wrong. Of course they know that the automotive trade is fundamentally right, so they would have staged the show for its moral effect, even if convinced that it was to be a complete financial loss for the time being.

Building the Dealer Organization

Just now the northwestern question is "how to get the dealer organization back." The former organization is shot in most cases, because the small dealers could not do business when farmer and small town folk were not buying. But a good many of these ex-dealers and some who have been hanging on by the tire and service strings are coming here to learn what is the prospect for 1922. The show, and sales being made there, are the answer. The prospect looks like there is business to be had for the man who will fight and smile, and some smiling fighters were made here this week.

There is hardly a distributor or branch organization that has more than half as many dealers as it had a year ago. The rest have been written off the books—they lapsed into plain garage-keeping or have gone wholly out of the automobile business. Of the dealers left, some haven't sold a car in a year, some haven't a car to show to prospects or even a demonstrator. And some distributors, when the show opened, really hadn't a dealer they could call a dealer; that is, a dealer with an active selling organization, be it ever so small.

Some distributors who normally class their business as 75 per cent wholesale and 25 per cent retail went through last

year with only 25 per cent wholesale, and there are one or two whose wholesale dropped to 15 per cent of their aggregate volume. Their city sales staffs fought for sales and made them, with the advantage of the diversified city market to help them.

Their country dealers, facing bankruptcy of 30 per cent of the farmers, inability or refusal of the others to buy with farm produce prices so much farther down the scale than the prices of everything they had to buy and inability or refusal of country bankers to finance time sales, went out of the selling business wholly in some cases and in other cases so much so that they were of little value to the distributor.

But they are going to sell automobiles in the northwest in 1922!

They are selling some, not many, at the show.

And, just as though there had been no scourge of business restriction, which can hardly be described by one who has not felt it, a scourge laid upon the back of the farmer and little merchant and mill man and workman and banker alike, the people of this territory have been going to the show and giving their names as likely prospects for automobiles when spring clears away the snows that make winter motoring a novelty in all but the city centers.

Information and Inspiration for All

The show has presented a wonderful object lesson, not only to distributors and their sales staffs, but to hundreds of dealers who have come in from the territory, many of them travelling all night by train, some of them a day and a night, to get here. Men don't spend a hundred or two hundred dollars to look at automobiles in a show.

They came here to look into the prospects for spring business, they saw evidences of these prospects in the show and at the meetings arranged by distributors and branch managers they obtained inspiration and information to go back home, some of them with duplicates of orders for cars in their pockets, and get back into business in 1922.

Neither distributors nor dealers look for any remarkable improvement this year, either in ease of making sales or in sales volume.

If there is a good crop, bringing at least fair prices, in the late summer and fall, much of the indebtedness and frozen credit due to falling farm prices, land speculation and unwise investments, will be cleared away and there will be a spur of fall buying.

They need two, and in some territories three, harvests to get squarely on their feet again in this great agricultural area, but so much betterment is possible in 1922 and there is so much prospect of its being brought about that the leaden skies of 1921 have given way to quite a respectable bit of sunshine.

Despite the reflection of the farmer's buying strike in the cities, city automobile men sold cars—quite a decent volume of them—last year. They found bankers and professional men and merchants and industrial men and some salaried and wage earning people—for individual pay has not gone down much here—able to buy cars. They sold them.

Dealers from the territory saw these sales records this week

and, thinking of bankers and lawyers and doctors and merchants in their own towns, have gone back home determined to demonstrate some of them out of their pessimism and into a desire to own the splendid cars of 1922.

To Help the Dealer Make Retail Sales

And these dealers from their smaller cities and towns and hamlets won't have to do the job alone. The experience of last year taught distributors that it pays to hold their dealer organizations together, even at the expense of helping them make retail sales. So this year, as in 1921, travelers for the distributors will be found not merely going through their territories to check dealers up on their stocks of cars and parts, but to show them, by doing it, how to find, list, canvass and close prospects.

Some factory sales managers who have been here this week have accused dealers, to their faces, of "laying down" in 1921. Some did, no doubt, but the distributors, whose view of the situation is practical rather than academic, have seen sometimes reason for lack of faith in a man surrounded by lack of faith as exhibited in the conversations of all his fellow townsmen.

With this understanding, the distributors have been going out, making sales to prove that sales can be made, giving dealers commissions that they didn't earn, to hearten them, and putting something more than orders from headquarters into their territorial contracts. Some distributors have taken used cars from their dealers to enable them to sell new ones, but there will not be much continuance of this practice this year.

Dealers Expected to Get Out and Hustle

Generally speaking, distributors and branch managers here will not load their dealers with cars this year. But they are going to insist that dealers who expect to stay on their lists must make up and use prospect lists, hire salesmen or get away from the shop and the gas pump and do some selling themselves and must have reasonably adequate facilities to service owners' cars. Dealers of the type of a man who held a contract throughout 1921 without employing a single salesman in a territory of 50,000 people, will be scratched off this year.

This is the picture of Twin-City show week—a territory down, but not out, and with prospects of gradual improvement in 1922; a trade chastened as business is seldom chastened in a whole generation; a trade down to bedrock in overhead and convinced of the necessity of persistent hard work; a market for cars probably a little greater than that of 1921; a banking fraternity which is beginning here and there to say, "Let's see what he's got," instead of plain "No," when an automotive merchant suggests taking a buyer's notes for part payment on a car.

Trucks have sold even more slowly than cars, and, except for industrial and road work, there will be no great increase in sales this year. Farmers are not ready yet to resume buying equipment.

Equipment Sales Growing in Volume

Automotive equipment, which suffered with other merchandise, is already gaining in sales, to meet the demands of owners who are going to run their old cars another year. And dealers and garagemen, particularly in the larger centers, have turned attention to equipment sales while car sales lagged, with good results.

The show, staged in the Overland Building between Minneapolis and St. Paul, is the big exposition that an automobile show here always is. Walter R. Wilmut, who has conducted it for years as manager of the Minneapolis Automobile Trade Assn., has the huge building filled, all except a wing used, and enthusiastically and largely used, as a dance hall. Auto-

biles were shown by the entire Minneapolis trade. There were several good truck displays and both manufacturers and jobbers were on hand as automotive equipment exhibitors. The crowds were large and their interest was of the sort that satisfied exhibitors.

As usual, there was much in the exposition that was not automotive. Exhibits ranged from baby carriages to bricks. And it would hardly be fair not to mention that one of the most interesting and best dressed sections in the show was that of the Builders' Exchange, with a miniature city of fac-



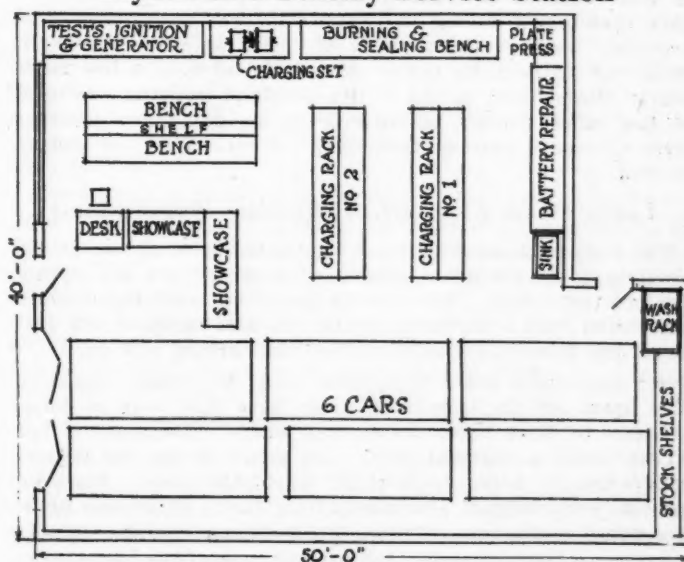
Section of the Twin City automobile show held in the Overland Bldg. between Minneapolis and St. Paul, Feb. 4-11

tories, stores, theaters, homes and transportation eclipsing anything in the automotive divisions for real educational exposition accomplishment.

There was an effort to present a historical exhibit, but the three cars of ancient vintage comprising it were all but lost back of some scenery on one of the upper floors. Yet part of the crowds, showing interest, sought the exhibit out, indicating what might be accomplished in any show by professional presentation of a historical idea.

Meetings of the week included distributors' dinners and luncheons and smaller all-business conference, with many factory executives present, and a large meeting of the Minneapolis Garage Owners Assn., at which Ray W. Sherman, merchandising director of the Automotive Equipment Assn., spoke and showed the "Ask 'Em to Buy" film.

Layout of a Battery Service Station



Those interested in a practical arrangement for a battery service station may find some suggestions in the layout of George Ryskamp's battery service station in Santa Barbara, Cal. In the rear center is placed the wash-rack. All incoming batteries are washed and allowed to drain off, the rack having a large sediment chamber which is cleaned regularly. The distance from cars to wash-rack is about 10 ft. and from wash-rack to charging benches about 15 ft., this arrangement saving many steps. The charging benches have a tray underneath kept filled with sand.

Tractor Show Is Confused by Price Cuts

Popular Makes Missing from Exhibition and Attendance of Farmers Is Far from Satisfactory—Motor Car Engineering Having Strong Influence on Design

By DAVID BEECROFT

THE consternation injected into the motor car industry at the New York show by general price reductions and delayed announcements of reductions, did not create such profound worry as the recent price reductions of Fordson, Samson, International Harvester Co., Wallis and some others have created in the tractor industry.

It is not overstating the case to say that the tractor field is split wide open. Ford's reduction from \$625 to \$395 for the Fordson precipitated what Harold McCormick, president of the International Harvester Co., has labelled a price war among the "big three"—Fordson, I. H. C. and Samson. The I. H. C. threw its hat into the ring by way of taking up Henry Ford's challenge with a reduction of \$230 in the 8-16 I. H. C. and throwing in a 2-furrow tractor plow, a total reduction of close to \$300. The I. H. C. also reduced its Titan model by \$200 and threw in a 3-furrow plow.

Samson, the General Motors' tractor, was reduced from \$665 to \$445. The Wallis tractor price was reduced so that a tractor and plow that one year ago sold for \$2023.75 now sells for \$995.

These reductions follow general price cuts made by many tractor makers during the last few months. They do not represent initial reductions. Many other tractor makers are at wits' ends as to what to do. Few additional reductions have been made during the annual tractor show being held here this week at the grounds of the Minnesota State Fair, while the Minneapolis motor show is being held a few miles nearer Minneapolis in the Willys-Overland building. Several of the other tractor manufacturers do not know whether they will make further reductions or not. They are deeply puzzled.

Lower Prices Expected to Stimulate 1922 Business

The Ford reductions have not stimulated sales as yet, as the farmers in the northwest are snowbound and are not buying tractors these days. There is no doubt but that the reduced prices will have a distinct influence on 1922 business, but just as yet the farmer is waiting to see what others will do.

Not only have price reductions split the tractor industry wide open, but the show being held here this week is doing its share to drive home the entered wedge. The show is not in any sense a national show; too many of the big tractor makers are not here. Look at the list of absentees: Fordson, Samson, International Harvester, John Deere (Waterloo Boy), Emerson-Brantingham, Moline, Rock Island, Larson, Wallis and other lesser concerns. Not a single one of the "big three" in the price war is here. The I. H. C. is absent for the first time. So is Fordson. Samson was at the show a year ago at Columbus, Ohio.

The show this week is not a very popular affair with the manufacturers and the attendance of dealers and farmers has been a keen disappointment.

It is a poor time for so great an industry to present so divided a front. Many makers did not favor a show in Minneapolis, and considered it better business to stay away to save the cost. There is only one real place for a national tractor show, and that is Chicago, the show to be held, perhaps, the same week as the automobile show. It could be held at the pavilion in the Union Stock Yards. The tractor show here this week should have been held in the Willys-Overland Building, along with the motor car show. The motor car distributors wanted it, but the tractor makers would not co-operate.

The present tractor show has but 23 makes on exhibition, as compared with 51 one year ago, and over 70 two years ago.

The past year, 1921, has been a very slow one in the tractor field, the business has not been more than 20 per cent of what it was in 1920. The tractor has sold in very limited numbers to farmers, but there has been a good trade with road building and contracting organizations. Creeper types of tractors, such as Cletrac, Best, and Holt, have been sold to state and county organizations and to cities and towns for road construction. With some companies these sales have been 90 per cent of the business for the year. It has been cash business and has often been in fairly good volume. Some tractor makers, not building creep-types, have developed road building models and these have sold well, while the agricultural types have scarcely sold at all.

The tractor manufacturer has not liquidated his inventory during 1921, as have most of the motor car manufacturers. Some tractor factories have been closed for one year. Some have not built a tractor for 15 months and have enough partially completed machines on hand to carry them six months under expected trade conditions. All of the tractor manufacturers stocked materials very heavily in 1920. Much of these materials are still on hand and the tractor maker is farther from being out of the woods than the car maker. The tractor maker had very largely only one class to sell to, namely, farmers, and when the farmer went out of the market there was no one else except the road builder and contractor and very few had tractors suitable for this work.

Some of the makes at the present show are: Cletrac, Avery, J. I. Case, T. M. Co., Advance-Rumely, Bates, Holt, Best, Twin City, Parrett, Whitney, Hart-Parr, Bryan Steamer, Bear, etc.

Estimate 70 Per Cent of Farmers Have Money

The prospects for tractor business in 1922 are better than for 1921. In this territory the leading bankers are of the opinion that at least 70 per cent of the farmers are in sound financial condition and are able to purchase tractors. Many of these have the money on hand to pay for them, but this does not mean they are going to buy. The remaining 30 per cent are literally bankrupt, although the bankers do not want them to be sold out; their sensible motto is not to strike a man when he is down. Many of these farmers purchased 160 acres of land at \$275 per acre and that land cannot be sold at any price today. It may be worth \$150 per acre or it may

be worth \$200, depending on whether there is a buyer or not.

Most of these farmers paid \$10,000 cash and gave a mortgage for the remaining \$34,000. The land is not now worth the face value of the mortgage and many farmers are just taking their loss of \$10,000 and letting the original owner take it for the mortgage. This 30 per cent of the farmers is pretty much out of the market for several years.

Farmer in Market After 1922 Harvest

It is the opinion of the bankers that none of the farmers, or very few of them, will buy before the 1922 harvest is assured. They are not going to buy on the prospect of a crop as they have done too often in the past. They are dealing more with certificates than ever before. Looking ahead, it looks as if 1923 will be a lean year and that it will be 1924 before the farmers will be a little out of debt and will have some real money of their own to spend. By that time many of them will have to buy, as their old machinery will be quite worn out. The farmer in the northwest has not had great crops for two years and he has learned the lesson of how we all can repair our shoes and wear them years longer than we ever thought they could. This applies to cars as well as to tractors.

The question most discussed among tractor makers is that of service. A tractor is only as good as the service it gives to the farmer. There is no united definite thought on this. The makers hold many different views, but they are all more than ever convinced that service is the yard stick by which future success in merchandising of the tractors will be measured.

Too many tractor makers are thinking too much on whether the tractor will be sold by the motor car dealer, by the implement dealer, or by some new type of power farming dealer.

The tractor will be sold by the dealer who can give the necessary service to make the tractor a dollar and cent investment to the farmer. This service does not mean free service, but good service—well paid for. It does not make any difference whether that dealer is a motor car or implement dealer. Any special name will not save him. He will be known by the service he renders. He will be in business to make money and for no other reason, and he will not make money in the tractor field unless he organizes for service and charges for it.

Tractor Show from Engineering Side

We had almost forgotten about the technical end of the tractor show and the tractor industry. It is not the biggest end, so far as the dealer is concerned.

There are a dozen tractors—perhaps more—that are sound good engineering jobs. Twenty or thirty of the poor engineering jobs that were at the shows two years ago are gone. There are a dozen tractors that, as engineering designs, are as good as our leading cars and trucks. There are good tractors at the show and there are good ones not at the show. There are some poor ones at the show and poor ones not at the show. The intelligent motor car dealer can distinguish between a good tractor and a poor one. He can soon discover those makers who are sound financially and those that are not. He must examine the tractor industry with both of his eyes wide open.

There are several firms making tractors that will not be manufacturing them three years hence. Some of the older

names in the industry are almost certain to pass out. They will give up tractors and will confine their efforts to manufacturing farm machinery, a business they understand.

Conceptions of what the future tractor will be are crystallizing rapidly. One conclusion becomes more apparent each year; namely, that the big type is nearly gone and the big volume of business will go to the small, two-plow machine. A few years ago sentiment was fairly general that the three-plow type would dominate, but that is changing and it is now more generally agreed that the big field will rest with the two-plow class.

The field of design is quite unsettled. There has been a perceptible increase in the creeper design, pioneered by Holt and Best, and taken up by Cletrac, Bates, Monarch, Bear and entered this year by Avery, one of the oldest makers of the wheel type. Two concerns have seized on the increase in

Fordson business and have attachment for converting Fordson from wheel to creeper. They remove the two rear wheels and put creepers in their place. Bates has developed such a device and so has a newcomer, Hadfield-Penfield.

Bates is priced at \$295 and the other at \$500, or \$105 more than the Fordson costs originally. The creeper type has taken the road building and contracting fields pretty completely in the past year. Notwithstanding this, only 10.5

per cent of the tractor makers today use the creeper design.

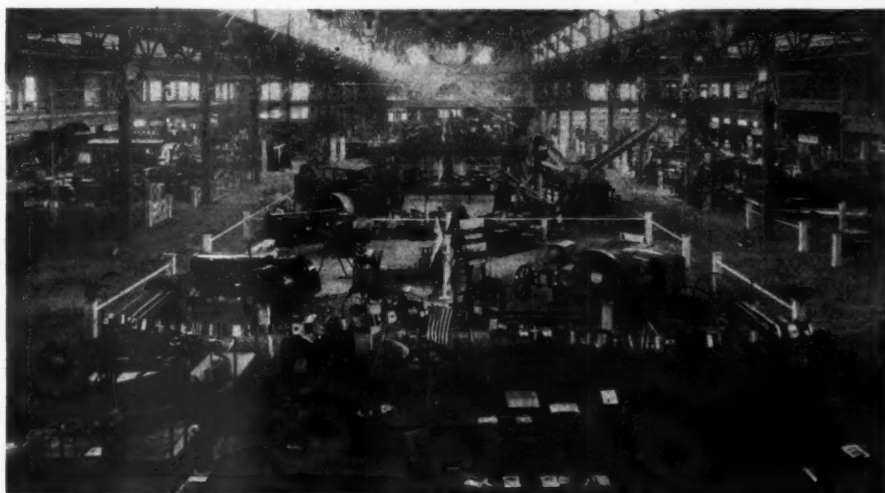
The 4-cylinder design has made great headway in the past few years and indicates the developing influence the motor car engineer has had on the tractor industry. Considering the entire tractor industry, 4-cylinder designs are used on 83.7 per cent of 123 models on which this calculation is based. Two-cylinder jobs are used on 14.7 per cent. Single cylinder types are used on .08 per cent and six-cylinder designs on .08 per cent. When the engines are classified on the basis of vertical and horizontal types, we find 71.5 per cent are vertical and 28.5 per cent are horizontal.

The great majority of wheel types use four wheels; in fact, we cannot recall a three-wheel design unless it is used as a corn cultivator.

The tractor engineer is busy evolving new designs to better meet the needs of the farmer. Cletrac has its new model F, brought out some months ago, and which can be had in three types. One model has the creepers set wider apart and the tractor is made higher for certain work. This is the first example of where fundamental changes involving tread and clearance can be made with very little change and not interfering with the engine or the transmission system.

Implement with Pressed Steel Parts

Cletrac has entered the field of manufacturing a cultivator for any line of cultivation. This cultivator is pushed ahead of the tractor and has two wheels. It can be attached and detached in a few minutes and all levers and controls are exceedingly convenient to the operator, who rides on the regular seat of the tractor. This cultivator is universal in that to its frame work can be attached a dozen or more different cultivating tools and these can be adjusted to suit a row of crops of any nature. It is the first serious attempt to furnish for the tractor a universal tillage tool. The cultivator is practically made of pressed steel parts, motor car practice,



Exhibits at the seventh national tractor and power farming exhibition, Minneapolis-St. Paul, February 6 to 11

and is in conspicuous contrast with castings as so generally used in the farm implement field. It marks the opening of a new epoch.

Dent Parrett, of the Parrett Tractor Corp., has an entirely new design of a light four-wheel tractor in which he uses a two-cylinder, vee design of air-cooled engine. The tractor is designed primarily to use with existing farm machinery. A farmer can buy this Parrett machine and hitch it onto any horse machine. It is primarily a substitute for horses and lists at \$495. It is intended to pull only one plow and has line or rein control so that the operator sets on the plow, disc mower or binder and drives the tractor with rope reins.

The present show is no indication of what development is really taking place in the tractor industry. There is scarcely a concern that is not working on improved designs, but there

are too many of the old models on hand to warrant any maker announcing new models. It will be a year before the engineering work that has been and is now taking place will be put on the market. Some large tractor makers have had a new design completed and in manufacture for nearly one year, but they are holding them off the market until the old stocks have been moved.

The Motor Car Dealer and the Tractor

The motor car dealers will find these good days to study the tractor industry. Many tractor makers are considering this dealer because he knows what repairing and servicing the gasoline engine means. Whereas the best mass of implement dealers do not. Service is the aspect of the business that will determine who will handle the tractor.

Kansas City Dealers Hold Peppery Pre-Show Meeting of Salesmen

A PRE-SHOW meeting of motor car and truck salesmen, with an entirely new atmosphere and purpose, was held in Kansas City the evening of February 10, at the Coates House. This was actually and obviously a "salesmen's" meeting—with a salesman presiding, salesmen providing the program numbers, and salesmen giving the key-note for the show. It was a meeting chock full of pep and enthusiasm and more than 500 salesmen attended.

Estel Scott, president of the Motor Car Dealers' Assn., without a speech, introduced George A. Wood, motor car salesman, as the chairman of the evening.

Advocate Employee's Association

"We owe a debt to the dealers for arranging this meeting," Mr. Wood said, "which is to help us build up enthusiasm for the big week ahead, that we know will be a long, hard grind. We all hope that there will be many more such meetings of salesmen. And it would be wonderful if we could have an employees' branch of the Motor Car Dealers' Assn., through which a fine spirit could be developed among us, and acquaintance and friendship might make competition more clean and pleasant.

"I can foresee that methods in this business would be greatly improved by such a branch, and benefit the salesmen. One leaving the city for good reason, would be able to show elsewhere his membership card in this body, indicating that he was in good standing, and perhaps eventually Kansas City dealers would have similar methods of judging value of men coming here. It would be a high privilege for any salesman to carry such a card in Kansas City."

Eddie Rickenbacher was the guest of honor of the evening. He spoke as a salesman and also as a manufacturer—pointing out the large success of most shows this season, the accumulating number of replacement buyers who must have cars this year, the fact that the manufacturer is now producing the very highest quality with only the best mechanics on the job, and that two conditions are approaching—a shortage of

My Creed

I am in the Automobile Business because I like it.

To remain in it I must make money for myself and my employer.

No matter what car I sell I can only sell my proportionate share, because I give my competitor credit for having a worthy product. I will not be a knocker. I know that my sales will be commensurate with my energy and ability.

I owe it to my employer and myself to give my best efforts; and so, every day I will play the game fairly, with resourcefulness, determination and energy to win.

—An Automobile Salesman.

threshing machines in the Kansas City territory. Selling today, he said, after the changing conditions of the last few years, must revert to that same old program of finding where equipment is needed and then selling it to the person who needs it. He urged that salesmen observe four steps in the selling program: First, to "sell" themselves, by smiling approach; second, to "sell" the dealer and the salesman's faith in his service; third, to "sell" the manufacturer, and fourth, to sell the product. He was frequently interrupted by applause—most hearty when he declared that "the day is past when a salesman can waste a prospect's time by talking about another salesman's car."

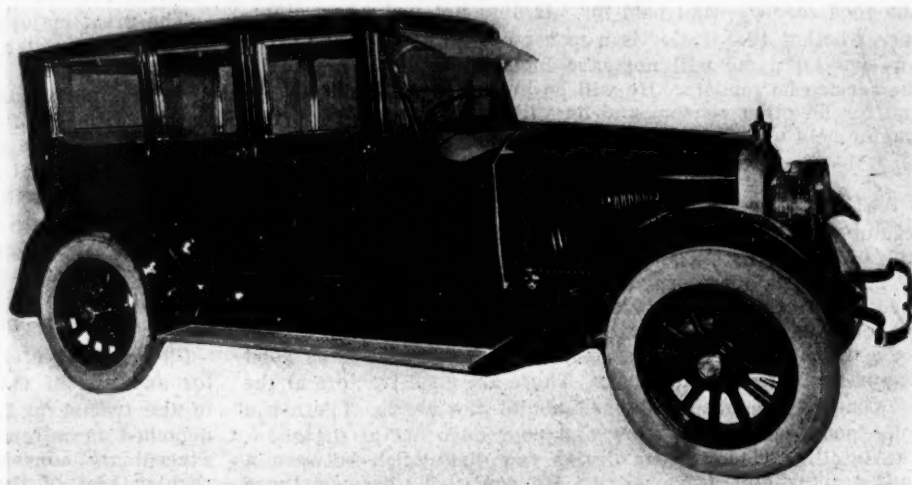
President Scott of the dealers' association, promised that another salesmen's meeting would be held immediately after the show.

Copies of a salesman's creed, reproduced here, and of answers to be used in meeting general questions during the show, were distributed.

cars, and an eventual increase in prices.

E. E. Peake delivered the "sales talk" of the evening; drawing upon his experience of several years ago in selling

New Dorris Seven Passenger Sedan



One of the striking body jobs exhibited at the Chicago show was this seven-passenger Dorris sedan. The windshield construction is well worked out and the two doors on each side afford ready entrance and exit. A low body effect has been secured by the drop in the frame, which has been a Dorris feature for some time

Mr. Dealer *takes his* Pen in Hand

A Booster for the Service Engineer

EDITOR, MOTOR AGE: I have been a reader of MOTOR AGE for nearly ten years, and during that time I have seen issues come and go, some ideas were adopted and some were tabled for future use. In the face of your repeated invitations to speak up, I have remained silent.

Now you have at last brought out the idea that has been close to my heart for many years, one which I have tried to make practicable, "The Service Engineer." I have been one of the so-called service managers for a good many years and have tried to do my share to elevate this place to one of dignity. I have been in a position to observe the relative superiority of the technical man over the ordinary good mechanic, and I want to say now that there is very little in common between them except that they both have been through the practical end of the industry and one has advanced greatly beyond the other, due to his advantage of being a semi-technical man, and being able to see through a mere local trouble into the causes.

When I first came to this city there was a certain well known make of car orphaned, the dealer having given it up due to its habit of pumping oil. Now, this car was a genuine oil pumper. I designed a sort of baffle plate to fit in the sub-base and installed it on more

than thirty cars of this model. It worked perfectly and was installed at a cost of \$7.85 per car. Not a single owner had spent less than \$150 on pistons, rings, drillings, etc., and the dealer was put out of business because he had no one in his organization who could remedy the fault, and he had three of the "good mechanics."

I could give you instances of this kind by the dozens. Every man who stops to think will realize that every mechanic

with a reputation of being good and have a title of "service manager" is in most cases a long way from being your "service engineer."

I like the combination, "Service Engineer;" it instills confidence in the owner, will put dollars in the cash register and lend dignity to the position—you are right, Mr. Editor, he is the coming man in service. Alabama Automotive Sales Co., H. N. Warren, Selma, Alabama.

Rebuilding Used Cars and Guaranteeing Them Profitable

EDITOR, MOTOR AGE: I have noticed recently some stories relative to dealers selling used cars under a guarantee for 90 days. This is a policy we have used in selling our rebuilt Dodge Brothers cars for about two years. We have found it to be very satisfactory, as it costs us little or nothing and enables us to secure probably 10 per cent more than we could have realized in direct competition without a guarantee.

We have made it a point to make good anything that was wrong, live up to the warranty and give the purchaser the benefit of the doubt where there was any question. As a result, I feel certain that our used car buyers are as well satisfied as our new car buyers. We have a steady market for our used cars, especially those we rebuild and guarantee

and we rebuild and guarantee all that are worth rebuilding.

We have about decided to refuse to trade for cars that we cannot rebuild and guarantee and believe if dealers would accept this policy in general and sell only serviceable used cars and sell them honest, that might go a long way toward solving the used car problem.—W. H. Imes Automobile Co., Topeka, Kan.; W. H. Imes, Manager.

TWO PROFITABLE SUGGESTIONS FROM A SERVICE STATION

EDITOR, MOTOR AGE: Here are two suggestions which I have found profitable in my business. When I first opened last February, I lost in the first month three tire gages and several pairs of pliers. I then took a pair of pliers and bored a hole in one of the handles and attached it to a gage with a small hose clamp and about two feet of chain.

I hand this combination to my customers when they ask for a tire gage so that they also have the pliers. I pay no attention to the customers when I hand them this and in ten months I have not lost a set, but, on the other hand, have worn out three gages. It goes to show that people do not carry these away intentionally, but, usually, thoughtlessly.

The other suggestion is for the grease gun for filling the differential and transmission. I used to have this grease gun put away in the rear of the building. I made a small platform about two feet square with a frame over it on which I put a sign, "Fill Your Differential," setting the grease gun on the platform just under the sign.

I found that this increased the sales of my gear grease so much that where heretofore I ordered it in 50 lb. cans, I now order it in 500 lb. barrels. I sell five times as much gear grease as when I had the filler put away in the back. M. O. Benscoe, Bankhead Service Station, Florence, Ariz.



The Van Norman Machine Tool Co., Springfield, Mass., uses this method of introducing to prospective customers, its Relio grinder. The machine is mounted on the back of the salesman's car and he takes it to the customer where a demonstration is given without trouble to the buyer

The Automobile Repairman's Helper

THE second edition of *The Automobile Repairman's Helper*, by S. T. Williams and J. Howard Pile, contains a vast amount of new material. The book has been divided into three parts, the first dealing with repairshop practice, the second with the more common service operations on the popular makes of passenger cars, and the third with mechanical operations on six different makes of trucks. The arrangement has been changed to simplify the finding of any material wanted and the indexes make every subject immediately available.

The first chapter presents some interesting and practical plans for service stations of various sizes and proportions. There is also a chapter devoted to a simple system of operation suitable for the large or small shop. Then follows the selection and use of shop tools, care and maintenance of tools, including both machine and hand tools, figuring the size, speed and strength of belting, etc. There also is given a set of plans and specifications to build a service car.

Under the shop routine there is set

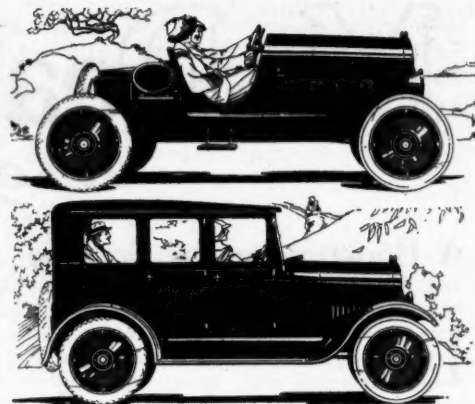
forth the proper manner of truing up crankshafts, cylinder, piston and ring work, carbon removal by oxygen, as well as the other more common service operations. An entire chapter is devoted to hunting troubles in the electrical system. Methods are set forth for straightening body and chassis parts, including mud guards, lamps, etc.

Service operations such as relining brakes, taking up play in bearings, clutch repairs, engine take-down and reassembly are given for the following cars: Dodge, Overland, Chevrolet, Reo, Cadillac, Studebaker, Oakland, Hupmobile, Willys Knight, Liberty, Cole and Chalmers.

Much the same information is given for the following trucks: Autocar, Republic, Reo, Garford, Koehler and Nash.

The Better Mechanics articles, which have appeared in *Motor World* since the first edition of the *Automobile Repairman's Helper* have been included in this edition and many changes have been made in the text to bring it up to date.

U. P. C. Book Co., 239 W. 39th St., N.Y.



Ames Bodies For Ford Chassis

A COMPLETE line of special bodies for Ford cars is being made by the F. A. Ames Co., of Owensboro, Ky. The Tour-Sedan pictured here is an enclosed model of long lines. It is 15 in. longer than the regular Ford sedan and about six in. lower. The frame is sturdy and reinforced to prevent squeaks or rattles. Attention has been given to the doors, which are wide and open far enough to allow easy entrance. They are equipped with concealed hinges and lever locks which operate from the inside. The crown fenders of 20-gage steel are finished in high-gloss black enamel.

The "Racer," also shown here, consists of body, trimmed and painted, radiator shell, gas line extension, radiator filler pipe and bolts for mounting. Side skirts and aluminum steps are furnished as extras. The radiator shell is three and one-half inches higher than the regular Ford radiator and gives the car a racy appearance.

Wisconsin Engine in Two New Models

TWO new models of engines have been brought out by the Wisconsin Motor Mfg. Co., known as the model "SU" and "NU." These are designed respectively for 1 to 1½ ton and 2 to 2½ ton trucks.

The SU is a 3¼x5, four cylinder engine. In designing this model the company has departed somewhat from the standard Wisconsin design, to incorporate features worth while from the sales and engineering point of view. The crankcase and cylinder are cast integral with removable cylinder barrel. This feature is advantageous in that in case of a score, it is only necessary to replace the barrel in the cylinder. Another feature is the overhead valve design, which affords more power desirable for the 1 and 1½ ton light fast trucks. The valve tappets are assembled on a plate, four on each plate and any necessary work on these parts may be accomplished by removing the plate and doing the work on the bench. The engine is force feed lubrication type.

The model NU, 4¼x5, a four cylinder engine, is similar to the rest of the standard line of Wisconsin engines, dif-

The Lavine Steering Gear

A STEERING gear of the split nut type in which is incorporated a large thread area has been brought out by the Lavine Gear Co. One of the features of this gear is that every working part is hardened and ground to gage. The trunnion blocks are made of chrome vanadium steel, and heat treated to withstand the special functions which they are called upon to perform. The trunnion shaft forging is annealed to relieve all internal strains, machined and heat treated for toughness and strength. After this it is ground to limits.

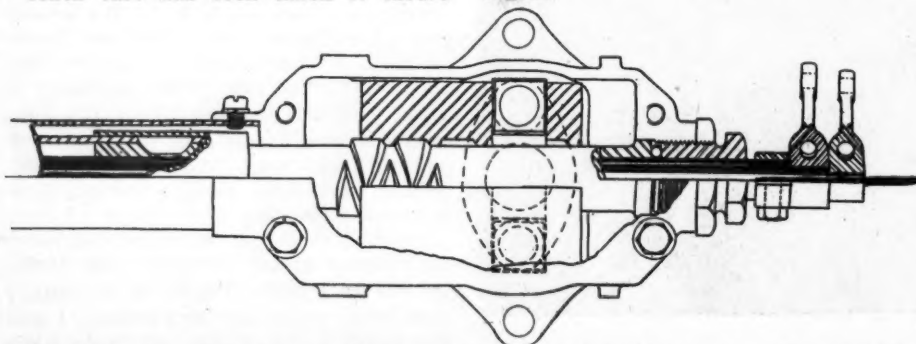
On the end of the trunnion shaft thirty-six 90 deg. taper splines are machined to insure correct setting of the ball arm when the latter is pulled into place. The ball arm is made of carbon steel annealed and heat treated to insure against crystallization. The bushings used in the steering gear are bronzed and reports have it that these during several tests have worn less than .003 in. in seven thousand miles.

Much care has been taken to insure

against rattle in the steering column. This company has a tubing resizing machine which insures that every tube entering the gear is true to size, both ends terminating in bronze bushings machined and reamed to size. The worm tube is attached to the worm first by a shrink fit, after which two Woodruff keys are placed on the tube. These are spot welded after which a one-quarter inch collar is shrunk over them. This collar is again spot welded in eight different places.

The maker of the steering gear lays heavy stress upon the lubrication incidental with this type of gear. It is reasonable to believe that the double plunger of the split nut always working in opposite directions quickly and evenly distributes the lubricant where it belongs.

The gear is very compact and this gives more room for clearance and the other units usually grouped around the engine.



Sectional view of Lavine steering gear, showing the double screw, split nut and blocks which operate trunnion shaft. The halves of the nut travel in opposite directions and therefore rock the trunnion shaft

fering principally in its being built more compact as to outside dimensions. This engine is of the L-head type.

Both engines are cooled by pump. The pump, magneto, oil filler, breather and oil gage are on the left side in the case of the "N U" engine, while the generator, starter, inlet and exhaust manifolds and carbureter are on the right side. In the "S U" engine the generator, starter, oil filler and gage are on the right side, while the pump, magneto, manifolds and carbureter are on the left side. All bearings are babbitt lined, bronze backed. Both engines are intended for three-point suspension in the truck frame.

KEMBLE NEW TYPE MUFFLER

A muffler which is radical in design and for which many claims are made is being marketed by the Powell Pressed Steel Co., Hubbard, Ohio. It offers a better compromise for certain uses than seems possible with the conventional type, in that it is said to give a lower back pressure, to weigh less, to be entirely free from clogging troubles and practically indestructible under service conditions.

As adapted to truck use, a series of circular holes replaces the longitudinal slot, and a short inner cone is added. The muffling effect is obtained by dividing the total outlet opening into a multitude of much smaller openings, which give correspondingly smaller noises, occurring successively, and so by "stringing out" the exhaust, soften it in much the same fashion as by a continuous longitudinal slot.

Cutler-Hammer Automatic Gearshift

A SMALLER, simpler automatic gear shifting mechanism has been developed by the Cutler-Hammer Manufacturing Company. No magnetic force or electricity is required to operate the new device, yet all the advantages of pre-selection of speeds by means of a small finger lever on the steering wheel quadrant are obtained in the same manner as with the magnetic type made by this company and used on Premier cars.

The shifting mechanism is mounted on top of the transmission as shown in the illustration. This leaves the entire front seat compartment clear as only a portion of the transmission lock shows in front of the gear shift enclosure. With a given speed pre-selected by the finger lever throwing out the clutch is all that is necessary to accomplish the result. Coasting by releasing the clutch pedal part way without shifting is also possible.

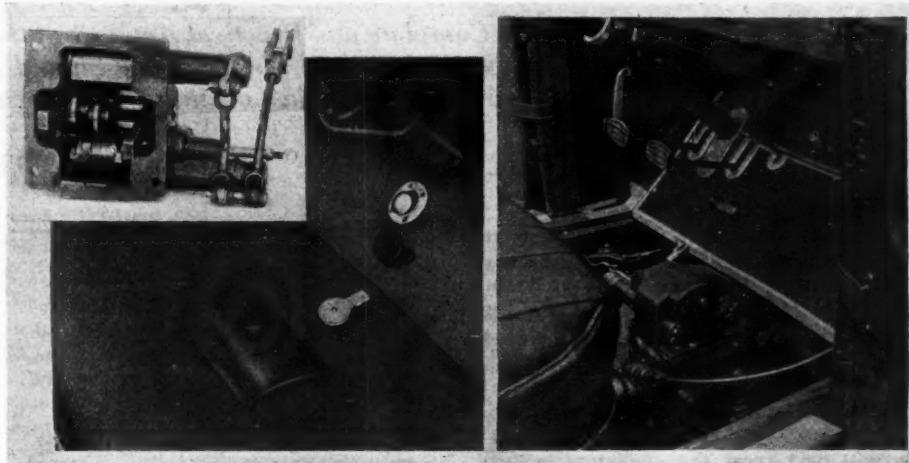
The movement of the selector lever through the various linkages moves a pair of roll levers inside the gearshift casing into the position corresponding to the speed selected. When the clutch pedal is depressed the cams are rotated, one roll lever being moved into the selected gear position and the other held rigidly in the neutral position.

The slip link shown herewith indicates

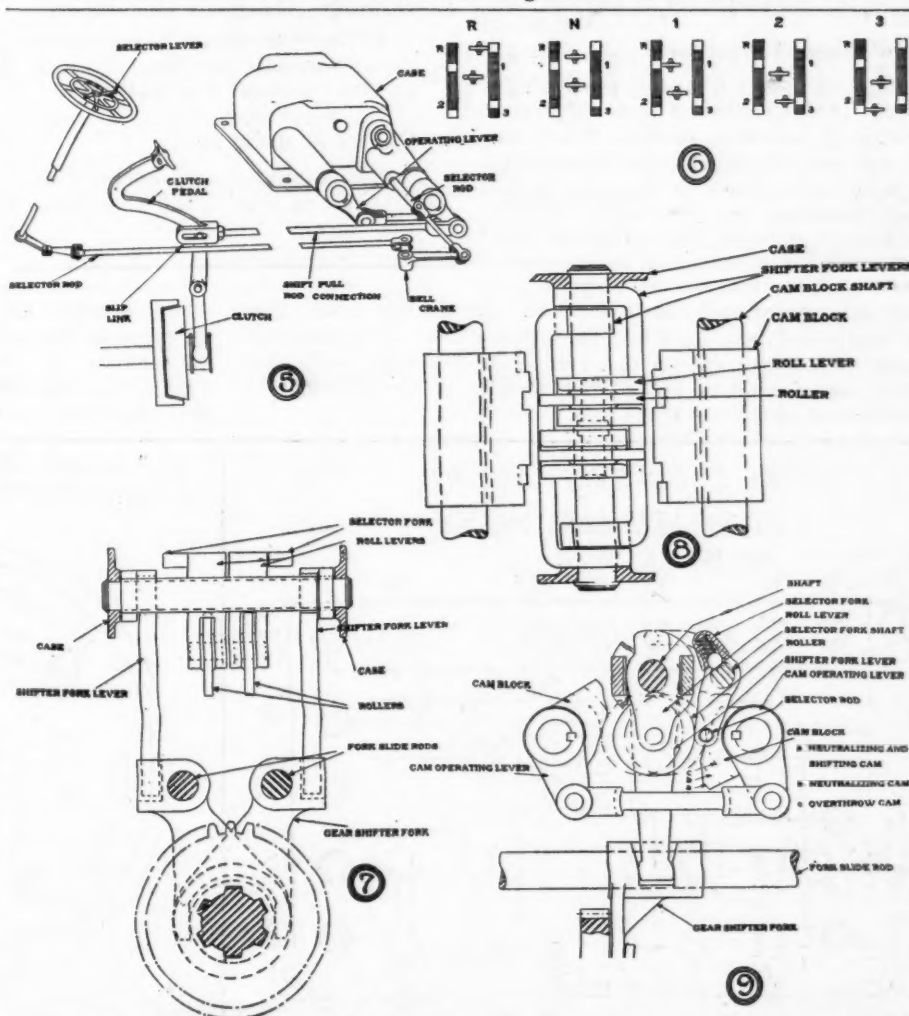
how initial movement of the clutch pedal can take place without moving the operating rod of the shaft. The cam blocks operate on two sides of the rollers carried by the roll levers. Pushing the clutch pedal forward moves these cams through a limited arc in such a way as to move the roll levers forward and backward.

The sketches show clearly how these rollers act in connection with the cams.

In reverse position R, the one roller is opposite the neutralizing cams and the other is held between the upper cams of the blocks which causes the forks to neutralize the gears and turn them into reverse. In the neutral position the rollers are held between the neutralizing cams, while in the next position one roller is still between the cams and one between a shifting cam and an over-throw cam.



How the new Cutler-Hammer automatic gearshift looks installed in car



Upper left, relative position of parts. Right, schematic diagram explaining action of cams. The other views show the parts and their relative positions. Movement of the selector lever through linkages moves a pair of roll levers inside the casing into the position corresponding to the speed selected

WAGNER and REMY SYSTEMS

on

1921 STUDEBAKER CARS

This Article Is a Complete and Practical Analysis of the Electrical System on the Big Six, Special Six and Light Six and Should Be of Great Assistance to the Service Man in Locating and Correcting Troubles

By A. H. PACKER

ARTICLE FIVE

STUDEBAKER cars sold in 1921 were of three models, one being the Big Six, one the Special Six and the other being known as the Light Six. Of these three models, the Big Six and the Special Six have identical wiring and electrical equipment, but the electrical wiring and equipment of the Light Six is different. For this reason this article will first treat the electrical system of the Big Six, after which the layout of the Light Six will be discussed.

Two Types of Equipment

With the possible idea of preventing a tie-up in production in case of fire or strikes at any one factory, the Studebaker Corp., while using the same wiring scheme on all cars of any one model, made provision for using either Wagner or Remy equipment, this equipment comprising the starting motor, the generator, the cutout, the ignition coil and the ignition interrupter and distributor. For this reason, either type of equipment may be found on either model, and while the main wiring diagrams in this article show Wagner units, the Remy units could be substituted, without either electrical or mechanical changes on the car.

Save All These Articles

THEY constitute a valuable reference when "shooting" electrical troubles on the cars analyzed. The following have been described in previous issues:

Car	System	Issue
Ford	Ford	Nov. 10, 1921
Dodge	Northeast	Dec. 1, 1921
Buick	Delco	Dec. 15, 1921
Overland	Auto-Lite	Dec. 29, 1921

And more to come in future issues:
The Auto-Lite and Remy systems on 1921 Chevrolet F, B and 490.

The Remy System on 1921 Oakland cars, Model 34-C.

The Auto-Lite and Simms-Huff Systems on 1920, 1921, 1922 Maxwell cars.

ELECTRICAL SYSTEM ON THE BIG SIX

(Same on Special Six.)

(SEE PAGE 25 FOR LIGHT SIX.)

Wiring (Big Six)

In Fig. 1 is shown a complete wiring diagram, giving both internal and external circuits of all electrical units on the car, so that the path of any and all of the various currents can be traced. The wiring centers around the junction box, and as it is very important to understand the circuits of this box, they are shown both in the main diagram of Fig. 1 and also in an enlarged view in Fig. 2. In both of these views the internal connections are really on the back of the box, although shown in full lines for sake of clearness.

Lighting and Ignition Switch (Big Six)

In Fig. 1 the lighting and ignition switch is shown as though the electrician had removed it from its place in the cowl board for the purpose of examining the connections. It would then appear as in the lower view of Fig. 3, with the switch upside down, but the terminal markings right side up, making it easy to see the marks and trace

FIG 2 JUNCTION BLOCK 1921
STUDEBAKER CARS BIG SIX
AND SPECIAL SIX

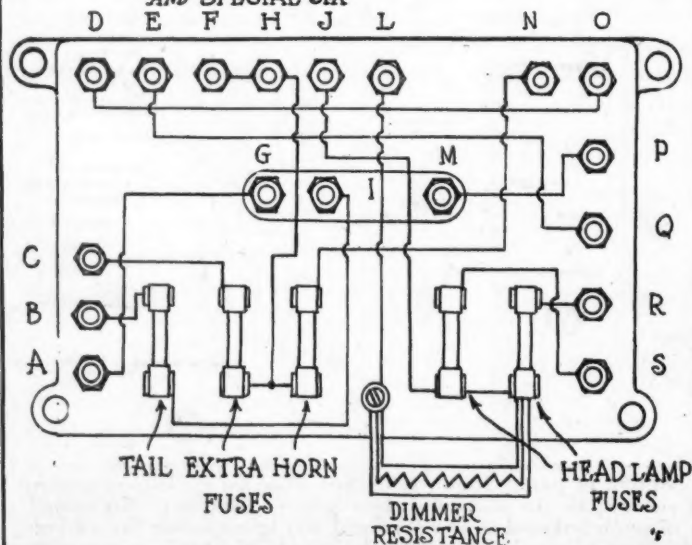
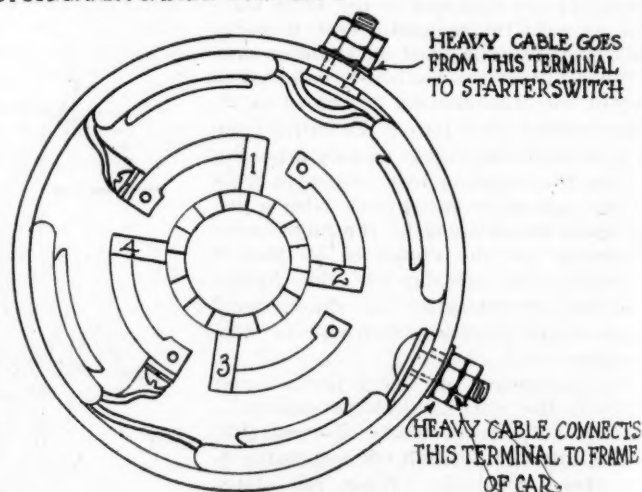


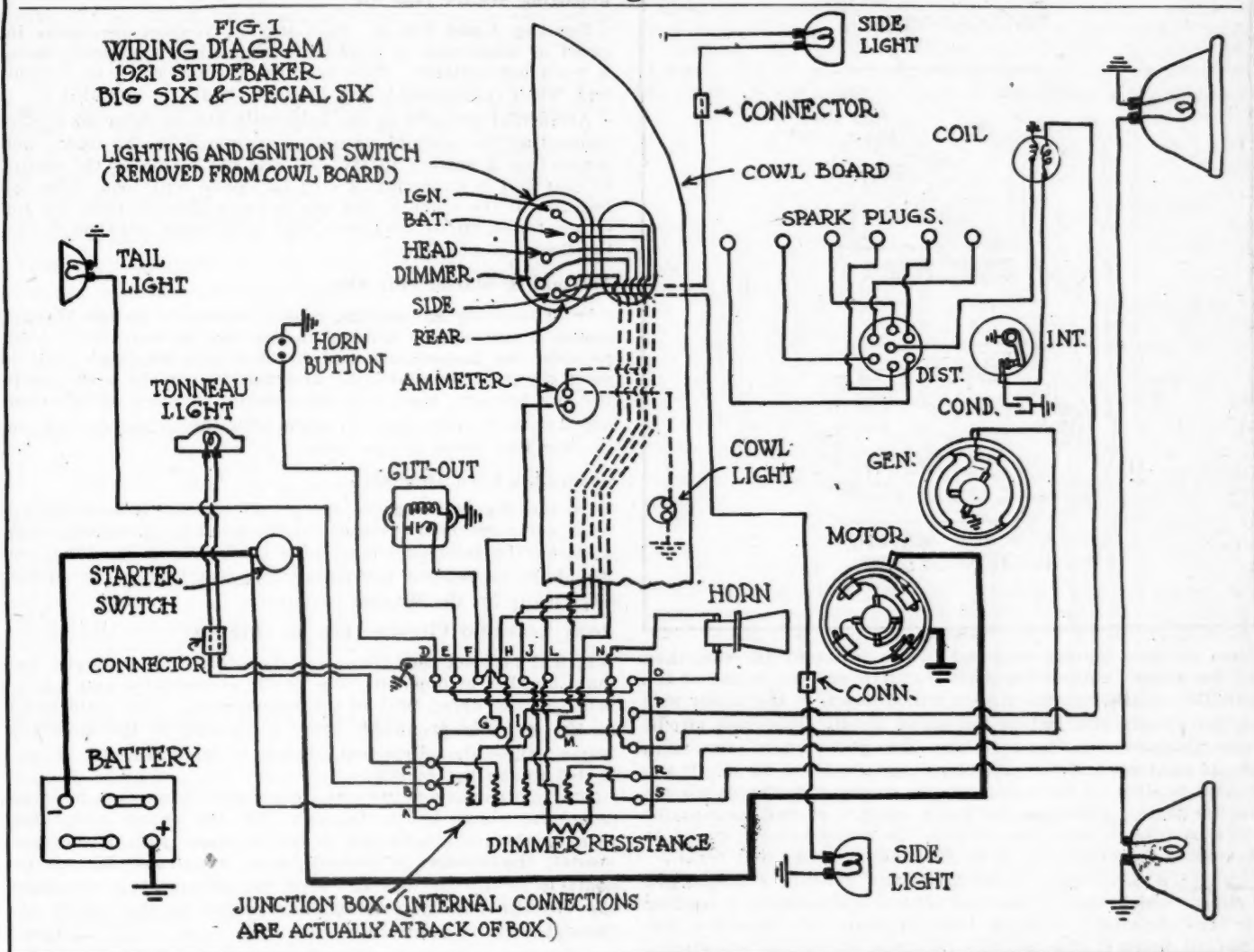
FIG. 4. WAGNER STARTING MOTOR ON 1921
STUDEBAKER SPECIAL-6 AND BIG-6



NOTE

ROCKER RINGS NOT SHOWN CONNECT BRUSHES 1 AND 3 TOGETHER AND BRUSHES 2 AND 4 TOGETHER.

Wiring Diagram of Remy and Wagner Systems on 1921 Studebaker Big Six and Light Six



the circuits. When replaced in its socket in the cowl board, it would appear as in the upper view of Fig. 3.

Current enters this switch at the battery terminal and the internal connections of the switch carry the current to the proper terminals. For example, with the ignition switch turned to the ON position, the BAT and IGN terminals are connected. (Both ON positions do the same thing.)

With the lighting switch operating, the following connections are made:

Switch Position	Terminals Connected
CURB	BAT to REAR to SIDE
ALL	BAT to REAR to SIDE to HEAD
OFF	NO CONNECTIONS
H&T	BAT to REAR to HEAD to DIM
CITY	BAT to REAR to DIM

With the exception of the internal lighting and ignition switch circuits, just described, all of the wiring is shown, and should be easily traced from Fig. 1 and Fig. 2.

Starter Circuits (Big Six)

Referring again to Fig. 1; it will be seen that the heavy cable carries current through the starter switch to the live or insulated terminal on the motor, the current then flowing through the motor to the ground terminal and back through the frame of the car. The fact that the positive battery is shown grounded, and that we have traced the circuit from negative to positive does not affect the action in any way. The internal circuits for the Wagner Motor are shown in Fig. 4, while those for the Remy Motor are shown in Fig. 5.

Starter Installation (Big Six)

The starting motor includes a gear reduction of about eight to one, while a further reduction is obtained in the chain drive

to the sprocket on the engine shaft. This sprocket includes an overrunning clutch which permits the starter to crank the engine, but does not allow the engine to drive the starting motor.

Starter Does Not Crank Engine (Big Six)

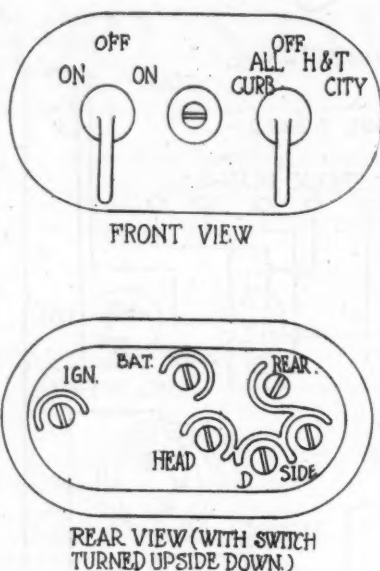
Trouble of this character may either be in the motor itself, in the battery, or in the wiring and connections, so that it is well to actually locate the trouble, rather than to remove the starter without knowing where the trouble really is.

The operation of the lights is usually a good indication as to the nature of the trouble, so that it is well to turn them on and then operate the starter switch.

LIGHTS' GOING OUT usually shows corroded battery terminals, which condition can be checked by taking a voltmeter reading across the suspected contacts, one at a time. For example, one of the voltmeter leads should be held on the positive battery post and the other on the terminal that attaches to this post. Then the starter switch should be pressed, and the voltmeter watched carefully. If there is very little movement of the voltmeter needle, the connection is probably alright, but if there is considerable deflection, say a volt or two, it indicates a high resistance. The terminal should then be removed and both it and the post scraped so as to make a clean connection. The other battery terminal should be similarly checked; also the connection where the battery is grounded at the frame of the car.

LIGHTS' STAYING THE SAME while the starter switch is pressed shows an open circuit; that is, no current flowing to the starting motor. This is often due to the brushes in the motor wearing down until they do not touch the commutator, but may also be in the wiring or starter switch. To locate this trouble, a six volt test lamp should be used first connected

FIG. 3. IGNITION AND LIGHTING
SWITCH 1921 STUDEBAKER
BIG SIX & SPECIAL SIX



from the live battery terminal to the frame of the car, then at the battery side of the starter switch and the frame of the car; then with the starter switch held down, at the motor side of the switch, and last at the motor itself. The open circuit will always be in between the last place where the lamp would light up, and the first place that it fails to do so. If the circuit is alive all the way up to the motor, it indicates trouble in the motor, either in the brush contact at the commutator or in a broken strap connection. In either case it would be necessary to remove the motor to make a permanent repair.

LIGHTS' GETTING VERY DIM may indicate a discharged battery, which can be checked with a hydrometer, a reading of 1280 showing a charged battery, while 1150 shows a discharged battery, intermediate readings, of course, showing a partial charge. Another check can be made with a low reading voltmeter, say with a 0-3 scale, readings being made at each cell of the battery, with the starter switch depressed. Good cells in a charged condition will show about two volts, while discharged cells may show 1.6 volts. If a cell is defective, due to rotted separators which cause internal shorting, the reading will either rapidly drop to zero, or may even show a reading in the wrong direction, due to the current from the other cells, and the fact that this cell is acting as a resistance or load instead of a source of voltage.

Should the battery seem to be alright, the total voltage being five or more with the current flowing, it is possible that there is a ground in the motor, which, while pulling a heavy current, does not produce much turning effort. This can be checked by using a high reading ammeter, either 350 or 500 amp. scale, in series with the battery while the starter switch is held down. A reading over 200 amp., say from 350 to 500, would undoubtedly show some such internal motor trouble, if both the motor and the engine are mechanically alright.

Mechanical trouble, such as frozen bearings in the motor, would, of course, cause a similar high discharge from the battery.

Removing Starter (Big Six)

To remove the starting motor, it is well to remove the chain, which can be opened up by turning until the proper link is found. Loosening a clamp nut under and at the front of the motor will then partially release it, and the pin in the hinge between the motor and the crankcase can now be removed by pulling the cotter pin which holds it. The hinge pin can then be easily driven out with a punch.

The hinge mounting is used so that the chain can easily be tightened by merely loosening the lower clamp nut, swinging the motor outward and again tightening the clamp nut.

Repairing Starter (Big Six)

See Fig. 4 and Fig. 5. Most starter troubles are easily located by inspection, a condition commonly encountered being a worn commutator. This requires turning down in a lathe, and, when reassembled, new brushes should be installed.

Accidental grounds in the field coils can be detected by disconnecting the normal ground connections in the motor and connecting a battery to the coil and the frame of the motor. If that coil is grounded, a curl of smoke will soon show the location of the trouble, and the coil can then be removed and either taped up or insulated with fish paper between it and the frame or pole piece.

Assembling Starter (Big Six)

In assembling the starting motor, especially on the Wagner motor, it may appear difficult to hold up the brushes in order to slide the commutator end bracket into position. This is most easily accomplished by first assembling the armature in the end bracket; then with the brushes in place on the commutator, it is very easy to slide both the armature and the bracket into place at the same time.

Generators Used (Big Six)

On the Big Six both the Remy and Wagner Generators are used, being mounted vertically at the front of the engine. Fig. 6 shows the internal connections of the Remy machine, and Fig. 7, if we neglect the cutout and coil bracket, is correct electrically for the Wagner Generator.

Remy Generator Circuits (Fig. 6.) (Big Six)

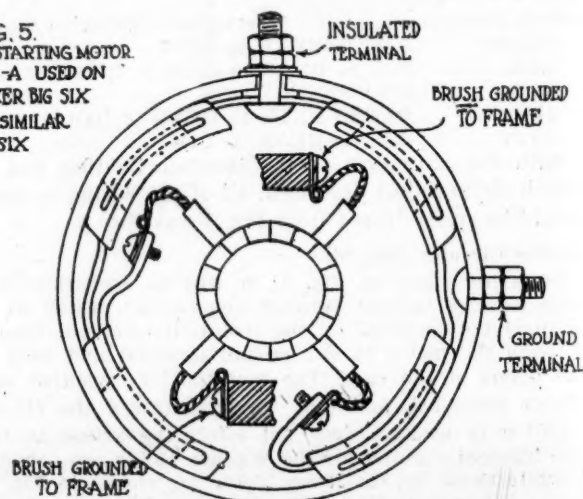
It will be seen that there are three brushes employed, two main brushes at opposite sides of the commutator and a third brush at the upper part of the commutator. The main brush at the right is grounded, being connected to the generator frame, while the other main brush is insulated and is connected to the live terminal.

The field consists of two coils, these being connected in series from the third brush through the left hand coil, then through the right hand coil to the insulated part of the thermostat, the circuit to ground being completed through the contacts in the thermostat. With the generator in operation, the current goes out the main terminal to the cutout and through it to the battery.

Thermostat Action (Big Six)

It is a well known fact that until overheating begins, both a generator and battery are capable of handling more than the normal amount of current without bad results. It is also known that for many reasons a battery should receive more current in cold weather than in hot weather, and the thermostat in the Remy generator is used for the purpose of allowing a high charging current to go from the generator to the battery in cold weather or when first starting up in hot

FIG. 5.
REMY STARTING MOTOR
TYPE 736-A USED ON
STUDEBAKER BIG SIX
CIRCUITS SIMILAR
ON LIGHT SIX



weather, after which the current is reduced by the action of the thermostat.

The operation of the thermostat is due to the use of a piece of metal which is made up of two different metals welded or rolled together, so that mechanically they appear as one piece. In Fig 6 this strip is grounded and holds the lower contact to which the field current flows to get to ground.

The two metals used in the thermostatic strip are selected because they expand with heat, but at different rates, so that heating of the strip will produce a bending action, as one side of the strip expands faster than the other. Being located just above the commutator where it is subject to the generator heat, the thermostatic strip will soon bend, as the generator gets hot, and the bending action will be such as to open the contacts through which the field current is flowing.

This would entirely stop the machine from generating if it were not for the resistance which is connected across the contacts, and acts to reduce the field current when the points open. With the field current reduced, the generator will not send so much charging current to the battery, so that the output hot is in the neighborhood of 10 to 12 amp., while when cold it will be from 18 to 20 amp.

Thermostat Construction (Big Six)

In Fig. 6 the upper contact is shown as a screw adjustment with a lock nut. This will be found, however, to be soldered in place so that the setting cannot be changed. This is done at the factory, by the use of an oil bath of a certain temperature, and THIS ADJUSTMENT SHOULD NEVER BE CHANGED. Even the authorized service stations do not touch this adjustment.

The upper contact just described is on an insulated finger, but the lower contact is on the bi-metallic or thermostatic strip, which is grounded by the tubular rivet shown holding the assembly together.

Output Setting by Third Brush Adjustment (Big Six)

While the thermostat should never be touched, it is possible to set the cold output to from 18 to 20 amp. by loosening the lock screw on the commutator end bracket and shifting the third brush to get the desired results. Moving it with the direction of rotation will increase the charging current to the battery. The lock screw can then be tightened again to prevent brush shifting.

With this setting when the generator is cold, it will be found that as the generator heats up the thermostatic points will open, putting the resistance in the field circuit and reducing the generator output to about 10 or 12 amp., which is alright for hot operation.

Wagner Generator (Fig. 7) (Big Six)

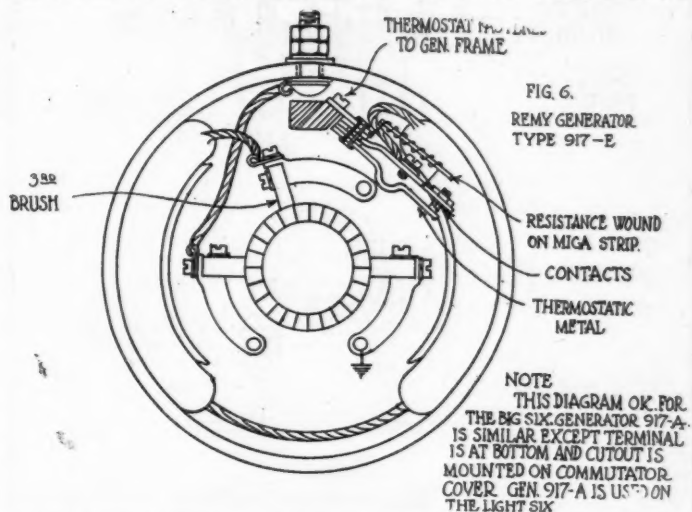
While this sketch was made for the generator used on the Light Six, it is also electrically correct for the Big Six, but there is no coil and cutout bracket used for the Big Six, the coil having a separate mounting and the cutout being located on the dash.

The action is similar to that described for the Remy generator except that no thermostat is used, the third brush

setting also acting in similar manner, being controlled by a lock screw on the outside of the bracket.

Testing Car for Generator Trouble (Big Six)

Referring again to Fig. 1; it will be seen that the action of the generator as the engine is started is to first send current to terminal "Q" of the junction box, through the box and terminal "E" to the cutout, and through the fine winding of the cutout to ground, the frame of the cutout being attached



to the metal front of the dash. Details of the Wagner and Remy cutouts are shown in Figures No. 8 and 9, respectively.

As the voltage increases and the cutout closes, connection is made back to terminal "F" of the junction box, then to terminal "H" and out to the ammeter, then back to terminals "G" and "A" of the junction box and from "A" to the side of the starter switch that is connected to the battery. The generator and battery are thus connected and the charging current flows until the engine is stopped, when the cutout opens and breaks the circuit.

Operating Cutout Points to Locate Trouble (Big Six)

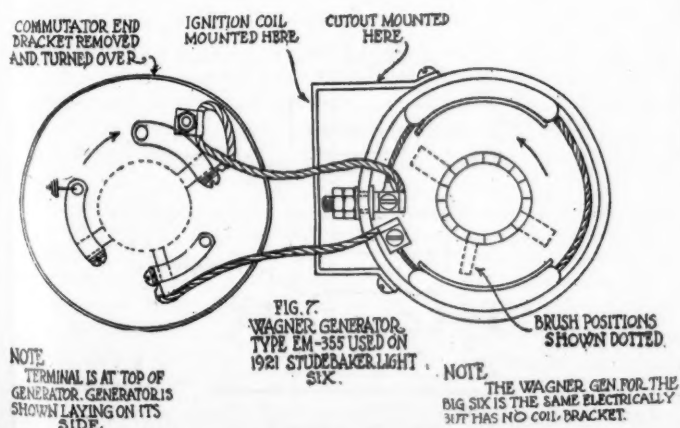
To check the field circuits, it is advisable to lift the grounded main brush in the Remy generator or the live main brush in the Wagner generator from its contact with the commutator, and then close the cutout point by hand. An indication of from 4 to 5½ amp. on the car ammeter would show current going to the fields and that they were probably alright. With the Remy generator the thermostat points could also be held open to see if there was a reduced value of current, indicating that the resistance was alright. If no current was obtained with the points open, it would show a burnt-out resistance.

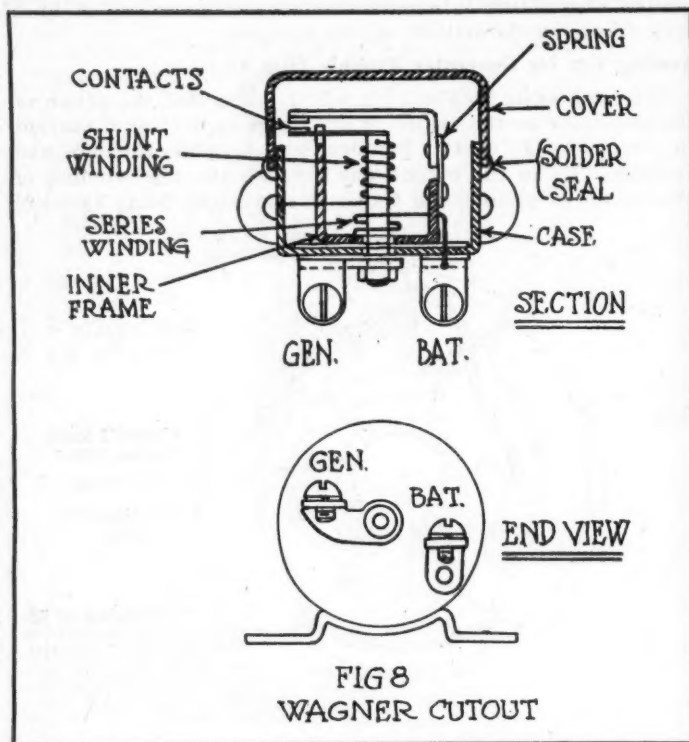
After checking the fields, the brush could again be dropped onto the commutator and the cutout points held together to check the armature circuits. The combined field and armature circuits should now draw from 15 to 20 amp., but if only field current is indicated, it is quite likely that one of the main brushes is worn down and not making contact with the commutator. Such a condition usually requires the removal of the generator to make the repair properly.

If both field and armature circuits appear to be alright, the engine should then be started, the cutout points still being held together, and the discharge current should now decrease to zero and become a charge current, which would show that the generator was practically normal. If it tests as above indicated, the only possible trouble in the generator itself would be in poor contact of brushes or field connections which would not be sufficient to prevent charging when connected to the battery, but which might prevent the generator building up from its own residual magnetism.

If the generator charges alright when the cutout points are held together, but will not close the points, a check should be made with a voltmeter at the generator terminal and the frame of the car, and if the generator shows eight volts or more as the engine is speeded up, the cutout points should close.

The next check should be made with the voltmeter connected from the "GEN" terminal of the cutout to the frame of





the cutout. If the generator voltage is alright, but no voltage is obtained at the cutout, it shows an open circuit between the generator and the cutout, or else indicates that the cutout is not properly grounded.

If voltage is obtained at the cutout, however, and it shows no tendency to close, it indicates an open circuit in the shunt or fine winding, which condition usually requires a new cutout. It is, of course, possible that the spring is too stiff, so that if a more certain check on the shunt is desired, it can be made by disconnecting the wire from the "GEN" terminal of the cutout and connecting a voltmeter between the wire and the terminal from which it was removed. With the engine running and no reading showing on the test voltmeter, it is quite certain that the cutout is at fault.

Indication of Armature Trouble (Big Six)

Another condition sometimes encountered is that the fields and armature will appear to be in good condition but when the engine is speeded up, the discharge current, instead of going over to charge, will come up about to zero and go no farther no matter how fast the engine is run. This is a nearly certain indication that the armature is either shorted or grounded, which condition can be further checked, of course, when the machine has been removed.

Peculiar Symptoms With Remy Generator (Big Six)

With the Remy generator the customer will sometimes complain that the generator works alright when he first starts out but that after fifteen or twenty minutes' running it will stop charging, later may charge some more and then quit again. This condition is caused by a burnt out resistance in the thermostat which has no effect when the generator is cold but entirely kills the output when the generator has warmed up to the point where the thermostat points open.

The Wagner Cutout (Big Six)

In Fig. 8 are shown the circuits of the Wagner cutout, current from the generator going to the "GEN" terminal, which connects to the through bolt or core on which the winding is placed. It will be observed that the shunt coil of the winding is connected to this core so that the current can flow through the fine winding to the frame of the cutout which is grounded.

When the cutout points close current will also flow from the lower contact mounted on the core to the upper contact which is on an arm of the inner frame of the cutout, and from this frame the current will flow through the heavy or series winding to the "BAT" terminal.

The Remy Cutout (Big Six)

In Fig. 9 are shown the circuits of the Remy cutout, there

being separate coils wound on the two separate cores as shown in the sketch. The flow of current from the "GEN" terminal is first through the heavy or series coil to the cutout frame to which both of the magnetic cores connect, then through this frame to the fine winding and through it to the screw at the left, which connects to the base of the cutout grounded on the dash.

Ignition Circuits (Big Six)

Current for the ignition is obtained when the switch is turned on connecting the "Bat" and "Ign" terminals of the ignition and lighting switch together. From the "Ign" terminal the current goes to the "M" terminal on the junction box then through to the "P" terminal and out to the primary winding of the coil through which it goes to the interrupter and across the interrupter contacts to ground.

Details of the Wagner and Remy ignition coils are shown in Fig. 10 and Fig. 11, respectively, the construction appearing different but the operation being similar. One difference is noted, in that the Warner coil does not have a condenser, it being located just under the interrupter housing, while in the Remy system it is located in the coil. The connection is the same in both cases, however, as condensers in ignition circuits are always connected across or in parallel with the interrupter points.

The secondary winding in either system is connected to the center distributor terminal, the other end of the winding being grounded to the base of the coil.

Locating Ignition Trouble (Big Six)

When cranking the engine with the ignition switch turned on, the ammeter should be watched to see that current flows through the circuit as the interrupter points close, and that the current stops as the points open. Current all of the time would indicate a short, such as would be caused if the points were stuck together, while no current at all would indicate an open somewhere, possibly due to the points' not closing.

A very slight current flowing with the interrupter points open would point to a shorted or punctured condenser, which in the Remy system would require a new coil, while in the Wagner system a new condenser would be sufficient.

Two Types of Remy Coils Used (Big Six)

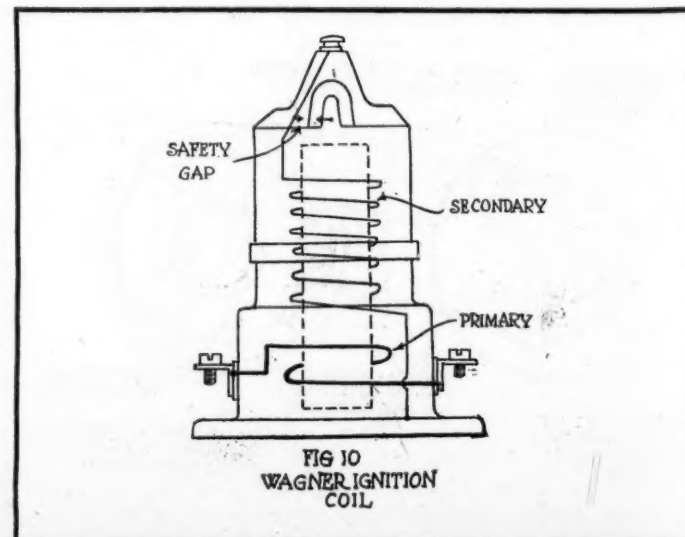
Should it become necessary to replace a Remy coil, great care should be used to see that the right type is found, as on the Studebaker Light Six the coil used does NOT have a condenser in it, while on the Big Six the coil DOES have the condenser, and as the appearance is the same, it is very easy to get the wrong one.

One way to tell is by the type number marked on the side of the coil, this being as follows.

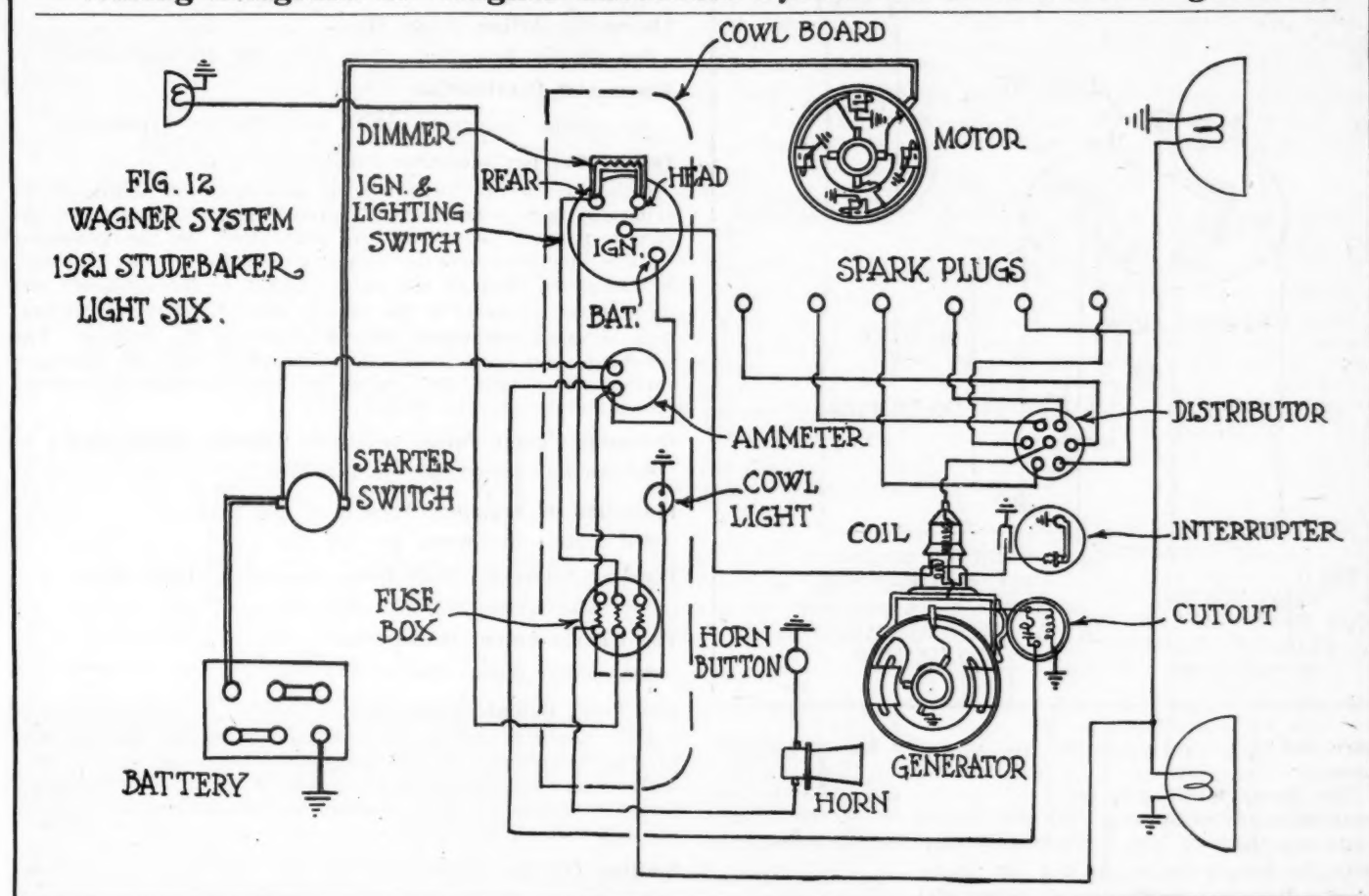
Coil No. 284 A (Has no condenser) Used on Light Six.

Coil No. 284 K (Has a condenser) Used on Big Six.

Most of the coils that do NOT have a condenser are also marked on the side "No Condenser" but this is not so on



Wiring Diagram of Wagner Electrical System on Studebaker Light Six



every one that has been produced, so that in some cases it may be necessary to test the coil to see whether it does or does not have the condenser.

Testing for Condenser (Big Six)

In Fig. 11 is shown not only the Remy coil, but also a method of testing by connecting from 110 volts through a lamp to the base and the terminal on top that is marked "Timer." The timer terminal is the one that on the car must be connected to the interrupter. If no condenser were used in the coil, the wires to the "Bat" terminal and the "Timer" terminals could be reversed without affecting the operation.

The test should be obvious from the figure, the wire marked "Shorting Wire" being connected to the timer terminal and its other end flashed at the base. A sharp snappy spark like the crack of a small whip indicates that there is a condenser in the coil, while a noiseless spark shows there is no condenser used.

Secondary Coil Shorted (Big Six)

Should the primary circuit appear to be alright, the interrupter points making and breaking the battery current circuit, and should the condenser also be alright, and still no spark or a small spark only be obtained from the coil, it is most likely that the secondary coil is shorted or punctured, in which case a new coil is required.

With battery ignition it is easy to test the spark by having the distributor cap off of the ignition head, so that the interrupter can be operated with one finger or with a pencil. The wire from the side terminal of the coil should then be disconnected from the center of the distributor cap and held about 3-16 in. from the engine or any metal part of the car. Then every time the interrupter points are separated, a spark should jump at this improvised test gap.

Then if no sparks are obtained at the plugs the distributor arm should be examined, as it may be defective and the spark may be jumping through it to the shaft instead of going to the plugs.

Electrical System on the Studebaker Light Six

Wiring (Light Six)

In Fig. 12 will be found the wiring diagram for the Studebaker Light Six, which differs from the diagram of the big six in several details.

First it will be observed that the junction box is not used, which simplifies somewhat the appearance of the wiring. The fuses are located in a separate receptacle at the right side of the cowl board where they can be easily replaced.

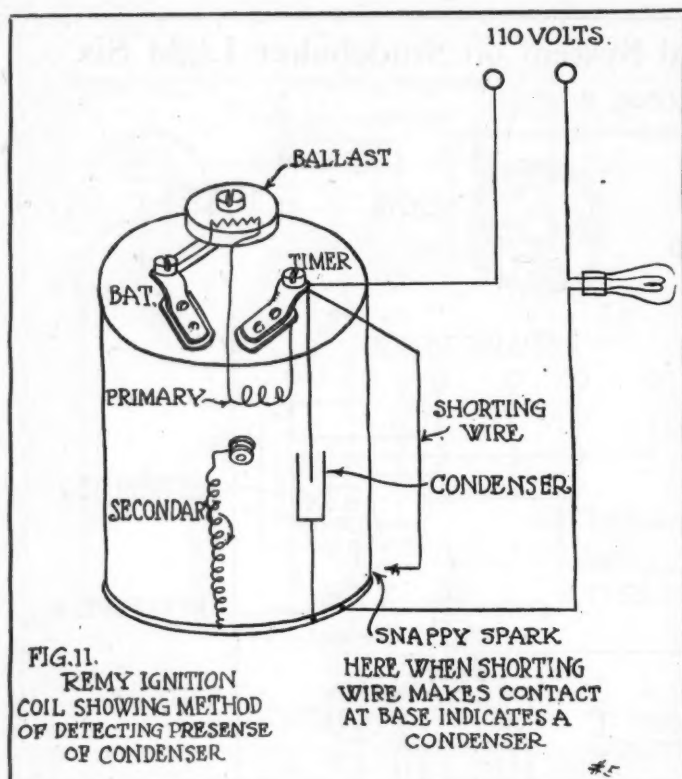
The ignition coil and cutout are mounted on a bracket on top of the generator instead of being separate, and in the lighting circuits it will be noticed that side lamps are omitted, the heads in the dim position being used when bright lights are not required.

Lighting and Ignition Switch (Light Six)

In the main wiring diagram the circuits are all indicated, with the exception of those inside of the lighting and ignition switch. With the ignition turned on, the "Bat" and "Ign" terminals are connected. With the switch in the DIM position, the "Bat" and "Rear" terminals are connected, giving current to the tail light and through the dimming resistance to the headlights. With the switch in the ON position, the "Bat" terminal is connected to both the "Rear" and "Head" terminals, giving tail light and bright head lights. Other circuits should be obvious from Fig. 12.

Starting Motor (Light Six)

In Fig. 13 is shown the Wagner starting motor, the drive being of the double reduction type, but the final drive being by a Bendix pinion meshing with the flywheel teeth instead of the chain drive used on the Big Six. It will be seen that there is but one terminal on the starting motor, the current going into the two brushes at the right and left in the sketch, then through the armature to the field coils and to individual grounds in each field coil. These are made in a rather novel manner, there being a slot in the pole piece into which the



bare end of the copper strap winding is set and soldered in place.

The Remy starting motor used on the Light Six is mechanically interchangeable with the Wagner motor, but its circuits are those of Fig. 5, previously described in connection with the description of the Big Six circuits.

Starter Does Not Crank Engine (Light Six)

To locate trouble of this kind, reference should be made to previous paragraphs describing the same conditions on the Big Six. Reference should be made to the correct diagram, however, this being Fig. 12.

Removing Starter (Light Six)

In Fig. 13 a flange will be seen at the left, this being the means of attaching the motor to the engine. To remove the motor it is only necessary to loosen the motor at this point, care being taken to see that the bolts do not drop down into the crankcase, or, if they do drop, to see that they are not left there.

Repairing Starter (Light Six)

See same heading for the Big Six.

Assembling Starter (Light Six)

See same heading for the Big Six.

Generators Used (Light Six)

The Wagner generator used on the Light Six is shown in Fig. 7, the connections being shown as if the commutator end bracket had been removed and turned over to the left, but with the leads to the brushes still connected. The bracket shown is for mounting the ignition coil and the cutout, Fig. 12 showing the general way in which these are assembled.

The mounting of the generator is not vertical, as in the Big Six, but horizontal, being attached by a flange at the rear of the water pump on the right side of the engine.

The Remy generator is mechanically interchangeable with the Wagner machine, but is electrically like the one shown in Fig. 6, except that the live connection from the main brush comes out through a bushing at the bottom of the machine instead of at a terminal at the top. The cutout in this case is mounted on the commutator cover, being like the cutout of Fig. 9 except that the base is curved to fit the generator and the terminals are brought out at the end of the base. The live connection through the bushed opening at the base of the generator goes to the bottom terminal of the cutout, which is the "GEN" terminal.

Remy Generator Circuits (Light Six)

See similar paragraph given with Big Six explanation.

Thermostat Action (Light Six)

See similar paragraph given with Big Six explanation.

Thermostat Construction (Light Six)

See similar paragraph given with Big Six explanation.

Testing Car for Generator Trouble

Referring to Fig. 12 it will be seen that the action of the generator is to send current through the fine winding of the cutout mounted on top of the generator. As the generator voltage increases and the cutout closes, the circuit will also be completed through the cutout points to the ammeter and through the ammeter to the battery side of the starter switch, then through the heavy starter cable to the battery. The generator and battery are thus connected and the charging current flows until the engine is stopped, when the cutout opens and breaks the circuit.

Operating Cutout Points to Locate Trouble (Light Six)

See similar paragraph for Big Six.

Indication of Armature Trouble (Light Six)

See similar paragraph for Big Six.

Peculiar Symptoms With Remy Generator (Light Six)

See similar paragraph for Big Six.

The Wagner Cutout (Light Six)

See similar paragraph for Big Six.

The Remy Cutout (Light Six)

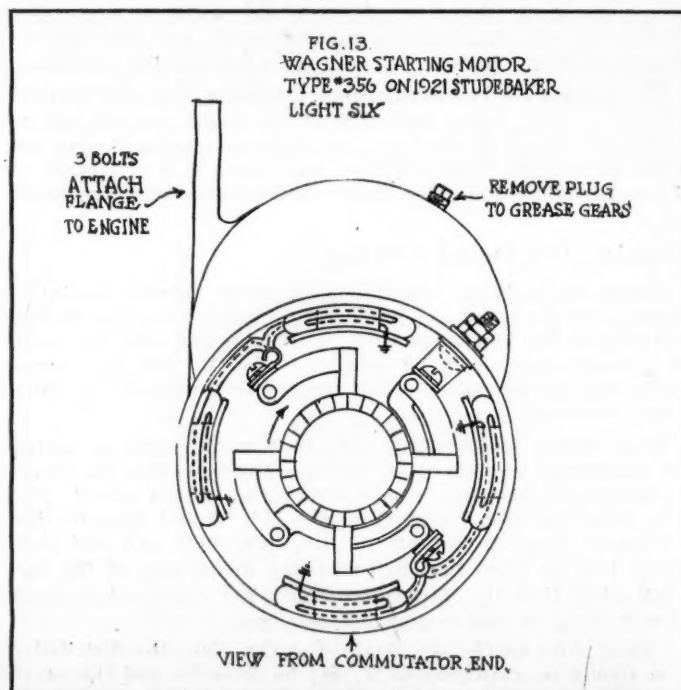
This cutout is similar to the one shown for the Big Six, in Fig. 9, except that the base is curved as previously described and the terminals come out at the end of the base. For description of its operation, see similar paragraph for the Big Six.

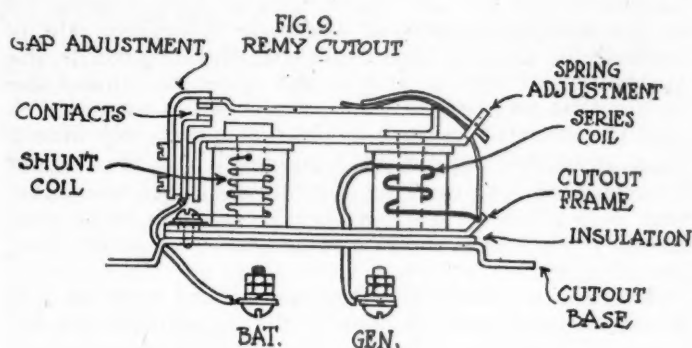
Ignition Circuits (Light Six)

The paragraph describing the ignition circuits for the Big Six is also correct for the Light Six, except that from the "IGN" terminal of the switch the current goes directly to the coil instead of through a junction box. The rest of the description is all right for either model.

Locating Ignition Trouble (Light Six)

When cranking the engine with the ignition switch turned on, the ammeter should be watched to see that current flows through the circuit as the interrupter points close, and that





NOTE

THE BAT. AND GEN. TERMINALS ARE MOUNTED ON CUTOUT BASE, BUT INSULATED FROM IT. IN THIS SKETCH THEY ARE SHOWN BELOW TO MAKE IT EASIER TO TRACE THE CIRCUITS.

the current stops as the points open. Current flowing all the time would indicate a short, such as would be caused by the points being stuck together, while no current at all would

indicate an open somewhere, possibly due to the points not closing.

A very slight current flowing with the interrupter points open would indicate a shorted or punctured condenser, easily replaced, however, as on the Light Six, both in the Wagner and Remy systems, the condenser is not in the coil, but in the interrupter. In the Remy system it is in a metal casing under the distributor cap, and in the Wagner system it is mounted just under the interrupter housing, where it is readily accessible.

Two Types of Remy Coils (Light Six)

Under this heading for the Big Six was described the difference in the two Remy coils, and the test there referred to should be used if in doubt, in order to see that a coil used on the Light Six does NOT have the condenser. However, the use of a coil with condenser would not be serious, as the two condensers would probably cause no serious trouble unless it would be to weaken the spark somewhat at high speed.

Testing for Condenser (Light Six)

See similar heading for Big Six.

Secondary Coil Shorted (Light Six)

See similar paragraph for Big Six.

The following is a partial list of electrical studies by A. H. Packer which will appear in future issues. Save them and they may save for you hours of time locating trouble in the electrical systems: "The Auto-Lite and Remy Systems on 1921 Chevrolet FB and 490;" "The Remy System on 1921 Oakland Cars, Model 34-C;" "The Auto-Lite and Simms-Huff Systems on 1920, 1921, 1922 Maxwell Cars."



Novel Traveling Parts Service for Garages and Repairshops

WHAT motor tradesmen declare a novel combination of merchandising and satisfying service has just been inaugurated in Denver by the McCarty-Sherman Motor Co., Ford dealers.

A Ford chassis, converted into a short-hitch trailer for easy turning, is equipped with a specially built body shaped like a house gable and roof and fitted with bins containing more than 300 Ford parts. This trailer is drawn by a Fordson tractor, driven by a parts salesman, and visits a select list of garages every day.

The parts body has hinged doors, which are easy to handle and easy to lock, and also contains a small cash register for the salesman's convenience in recording sales and making quick

change. All the parts business is handled on a cash basis anyway, and this cash register not only helps to save time for the customers but also fits into the cash program so well that it serves to smooth over in advance any temptation that might come to a garageman to protest that the cash basis is a nuisance.

The daily visits of the tractor-drawn parts supply house provide a service that is appreciated by the garagemen, who find the parts bins an excellent stimulant to their memory concerning supplies needed for the day's repair business.

Besides the convenience afforded, the garages and service stations, this "parts peddler" program attracts considerable attention along the streets throughout the city and helps to pave the way for

tractor sales to industrial concerns. "Seeing is believing," and the efficient work of this tractor in connection with this unique delivered-as-sold service helps business men to see the possibilities of economic uses for tractors in short-haul work around brickyards, for example, or in connection with other industrial plants. The tractor can travel 15 miles an hour, which is fast enough for ordinary purposes on city streets.

S. A. E. Takes Up Standardization of Frames

REPRESENTATIVES of passenger-car frame manufacturers recently got together and determined to undertake the standardization of passenger-car frames, as it is felt that such standardization would be of material assistance to passenger-car designers and to frame manufacturers.

The standardization of frames will be of special assistance to many frame manufacturers because passenger-car manufacturers are often willing to use a frame for which the frame manufacturer has the necessary tool equipment in case the design conforms fairly close to requirements. The adoption of definite frame standards will result in an increase in the number of such orders to the mutual advantage of both frame and passenger-car manufacturers.

The frame manufacturers of the S. A. E. standards committee division has definitely recommended a standard for passenger-car running-board brackets. The standard specifies but three sizes of brackets, but they are designed so that these three sizes will furnish a suitable range for all requirements by slightly shifting the position of the rivet holes in the frame. The width of the brackets can be changed readily to suit various widths of running-board.¹

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St. Valentine's Day

THE day of childish delight and pleasant memories, the one on which we honor St. Valentine, has passed, and with its passing comes the intimation that spring is near. On the sporting pages of the daily newspapers considerable space is taken to tell of the spring training plans of the base ball players. Within a few days we will begin to speculate on when the first robin will appear north of the Ohio river. Also we shall have news items in the near future telling how the peach crop has been killed, wheat frozen out and numerous other familiar incidents.

All of these things are the annual recurrence of events and all of them indicate the anxiety of certain financial interests to have their house in order for the big warm weather campaign. The people behind the base ball season, the peach crop and the wheat crop have been in business a long while and they appreciate just what it means to have a peach season. Also they know the importance of being ready when that season comes.

So far we have seen just one business getting letter from an automotive dealer based on the prospect of getting business for spring. This man, a progressive dealer with an up-to-date department, struck early in February in an effort to keep his shop busy during this ordinarily dull month. He is capitalizing the approach

of the driving season in and near Chicago. He is bidding for the overhaul trade that should precede the spring use of the car and in this letter to remind the owner that an average of weather conditions indicates that the car is of less use in February and early March than any other season. He suggests that this is the time to send it to the shop for the work that will avert idle weeks later in the season and also will be an economic investment, because prevention is cheaper than cure.

There is no doubt that the spring and summer will always be the peak months in the automotive service and sales business. Then is when the social use of the car reaches its peak. Most people are not the sort that spend money months ahead in preparation, but there are many car owners who are financially careful and who are quite willing to pay heed if the proper warnings are placed before them. So why not outline to them in a letter the advantages of having the car overhauled in advance of the busy season?

And just as surely as the spring season opens, there will be the opportunity to sell large quantities of supplies of all sorts that go with the increased use of the car, and the merchant who has not ample stocks ready cannot sell them in the quantities of those merchants who have stocks on display. The accessory and equipment dealer is now competing with all classes of merchants. The department store, hardware store and other bidders for this trade are very systematic in their preparations for the seasonal trade and the automotive accessory dealer must compete with them in this record. So we are putting out the suggestion that if you are not already active in the preparation for the great driving season of 1922, you have no time to lose.



Service Remains Long After the Price is Forgotten

IT IS acknowledged that the present day automobile is a better vehicle than ever before produced. Accessibility and provision for convenient chassis lubrication have been brought to a stage of development never before approached. Nevertheless some few parts of the chassis are the victims of sheer neglect. Foremost among these few parts are the front wheel bearings. The disappearance of the old style cup and cone ball bearing with its attendant troubles has given way to the more reliable annular ball and roller type of bearing. The old style bearings required constant attention to adjustment and lubrication if uninterrupted service was to be expected.

The relief from trouble due to the better designed bearings has been so marked that the attention formerly required and given has turned to carelessness regarding the lubrication justly due these parts.

The owner very seldom is aware of the condition of his front wheel bearings. He may follow diligently the instructions as printed on the manufacturer's lubrication chart; all except the portion devoted to the mechanism in discussion. This attitude extends in a lesser degree to some service stations. The practice recommended by the makers advises lubrication at periods varying from every 1000 miles to every 90 days of operation.

The removal of the hub caps, one or two nuts and the locking device can be accomplished in not more than 15 minutes per wheel. The necessary inspection, renewal of grease, and readjustment means an additional half hour at most. By this method the premature replacement of expensive parts is eliminated.

A little propaganda of the right sort would do much

to improve present conditions, and the owner should be informed either verbally or through the medium of a printed notice that his car does require methodical inspection.

A certain service station has acquired an enviable reputation because of the fact that none of their customers have ever experienced the sensation of being towed into their home port. They inaugurated a system of monthly inspection. This inspection was very thorough and was offered at a certain flat rate. A detailed report of the condition of the entire chassis mechanism was delivered to the owner. The inspection service was offered with the understanding that the owners' annual cost of operation would show a decided saving. The almost perpetual service rendered by the cars thus serviced has shown itself in the attitude of the owners who are believers that a stitch in time saves nine.



The Transmission Brake

THERE seems to be a growing tendency towards the use of the transmission brake. Aside from being good from a design and engineering standpoint, this layout has features appealing to those engaged in the maintenance work of automotive vehicles.

For one thing, it is usually a very difficult job to adjust the internal expanding type of brake, and a much simpler proposition is to be had when the service brake is built as a contracting band type on the rear wheel brake drums and a similar construction is used on the transmission shaft for the emergency brake. As a general thing, the transmission brake is very accessible, requiring for its adjustment merely the lifting of the floor board and one or two turns of a thumbscrew.

Relining is also a much simpler proposition because there is only the one hand to deal with, and it is vastly easier to remove this than to hold the rear wheels and dismount the internal expanding type of brake.



More Automotive Taxes

RECENT reports from Washington say that the Committee of the Lower House of Congress has practically agreed upon the eight measures that are to be employed to raise the money for the soldier bonus. Included in the eight sources from which taxes are to be collected are gasoline and automotive vehicles. The suggestion is that a national tax of one cent a gallon be placed on gasoline and a national tax of 25 cents per horsepower be placed upon automobile vehicles.

There has long been a desire on the part of the national government tax promoters to get a hold on the automobiles. For several years every suggestion of another tax has brought with it a suggestion of some part of a tax on the automotive vehicle. The trouble with the Federal tax plan is that it means simply another expense put on the owner of the vehicle.

Already a number of states have a gasoline tax, and this will mean another cent per gallon to be paid by the owner of a vehicle, which expense will fall about 40 per cent on farmers and very heavily upon doctors, salesmen and other professional men. All of which means that this additional expense must be included in the charge for the services of these men and it comes back in the end to the consumer of the farm produce, to the person who employs the doctor and to the consumer of the commodities sold and delivered by the aid of the automotive vehicle.

More than that, it means an additional sales resistant that the dealer in automotive vehicles must overcome. The higher the cost of maintaining a vehicle becomes, the more difficult it will be to sell the vehicles. The good accomplished by the engineer and the manufacturer in producing a car that is more cheaply maintained, is taken from the purchaser by the fact that his fuel will cost more, his license fees will be higher and so on.

The National Automobile Dealers' Association, the National Automobile Chamber of Commerce and other organizations have made a long and strong fight to avert this national tax, and if it is to be averted they will need all of the assistance they can get from the rank and file of the industry. The political situation is very acute this year and the voter is quite likely to receive more attention if he objects than ever before. Every dealer and every dealer's employee has a vote and as a voter he has a perfect right to expect his representative to pay some attention to him.

Why not let your voice be heard on this proposal? Perhaps a few automotive vehicle owners who object to more license fees will be interested if you speak to them.



About Taxes

DURING the show week in Chicago a good many speakers at the various functions referred to Federal and other taxes and the burden they made for the automotive dealer to carry. It was admitted by all concerned that this was a very heavy load and a good many suggestions were made as to how to lighten this burden.

It is encouraging that practically all of these speakers got back to the fundamental of taxation, by asserting that taxes are merely the reflection of the expenses of the government and that if the automotive dealer or manufacturer is interested in adjusting the taxes, he must first be interested in the governmental expenses. It is perfectly useless for a dealer to advocate lower taxes and at the same time make no effort to influence his representatives in the government to advocate economy measures. The same is true all the way down through the governmental divisions. In the local ward, or township, economy and money properly spent means a smaller tax.

The tax question will never be settled by those who wait until the tax is levied and then object. It will be settled only when there is effort before the levy is made. Some representatives of the automotive industry have been working toward this end in Washington and at state capitals but they never have received an adequate support from the great mass of dealers. This support should be forthcoming.



On the Used Car Problem

RECENTLY an investigator inquired of five factory sales departments as to the plans to solve the used car problem. The spokesman for each of these sales departments replied that they had no specific plan, except that new cars would not be forced upon the dealer and that territorial traveling men were being schooled in methods which he could recommend to the dealer to clear up his merchandise on hand.

This sounds pretty good.

Automobiles Hold Public Eye

Dealers Entering Market in Small Way Following Shows

Easier Credits Inspire Confidence—Whole Industry Working Toward Better Business Understanding

NEW YORK, Feb. 14—Further evidence of public interest in automobiles is found in the unexpectedly large attendance at the Minneapolis and other shows held last week. These sections, hard hit by the business depression, have demonstrated that the demand for automobiles will increase steadily as general conditions improve. That improvement is now under way.

One of the interesting developments at these shows was that many country dealers who have not stocked cars for months, are back in the market in a small way. This shows that credit is easier and that their confidence has returned.

A better tone in the market also is reported from most sections of the south. No great improvement is expected in the next two or three months but the general trend will be upward and substantial sales are expected later in the year.

Production at the factories is somewhat spotty, especially in those which produce cars in the lower price classes. A notable exception is Dodge which expects to be turning out 600 cars a day before March 1. Ford is making on an average of four days a week. Factories in the medium price class are coming slowly into heavier production. In the higher price class, Cadillac is running practically at capacity and Lincoln has been deluged with business since Ford took control and prices were reduced, although the reductions were not as large as had been expected.

Reports of better truck sales are becoming more general and production is increasing. This is true both in industrial and agricultural sections. The ratio of gain over the corresponding period last year probably is larger than in the passenger car field. Development of the cooperative marketing movement for farmers, which was approved by the senate last week, will open a large truck market.

Reductions in the lower price tractor field, following the lead of Ford, are becoming general. This indicates an expanding demand and keener competition.

Developments in all the branches of the industry are enlarging the business of parts and accessory makers. Their sales for January will show a gain over December and this month is expected to be even better. Sales to jobbers, which have been good for months, are holding their own and collections, generally speaking, are satisfactory. Even if passenger car production is no larger this

year than last, the business of parts manufacturers will be better because car makers have worked off their heavy inventories.

One of the engineering trends of the year will be in the direction of fuel economy and lower operating costs. Low gasoline and upkeep expense now constitute an important talking point in salesmanship.

Manufacturers have taken up in earnest plans to help their dealers solve the used car problem and substantial progress in this direction is being made.

Willys-Overland Financing Virtually Agreed Upon

NEW YORK, Feb. 12—Bank creditors of the Willys-Overland Co., whose claims aggregate approximately \$16,000,000, have virtually agreed upon a plan for funding the bank loans and providing new working capital. This plan, which must be ratified by holders of 75 per cent of the preferred stock, calls for a first mortgage bond issue of \$25,000,000, of which about \$18,000,000 would be issued. In order to secure working capital, however, the company would be obliged to become a borrower again from the banks. The plan of the bank creditors in this respect provides for the creation of a revolving credit of several million dollars.

Whether or not the preferred stockholders will consent to this plan remains to be seen. In some quarters it is considered highly improbable that they will. In that event, it is probable the banks will call the loans, which mature March 1. The inevitable result of such a course would be a receivership under which the banks would stand, in the eyes of the court, on an equal basis with all the other interests involved.

Farm Trust Authorized in Senate Cooperative Bill

WASHINGTON, Feb. 12—The Senate yesterday passed a co-operative marketing bill which authorizes farmers, ranchers, dairy men, planters, nut and fruit growers to act together in associations for collectively preparing, handling and marketing in interstate and foreign commerce the products of their farms, groves and ranches. Enactment of legislation authorizes cooperative marketing will result in greatly extended use of the motor truck by farmers.

APPROVE MILEAGE ADJUSTMENT

New York, Feb. 10—The standard tire warranty and the accompanying revision of mileage adjustment practices recommended by the Rubber Association of America, have been approved by 93 tire manufacturers. The list includes all the larger tire companies.

N. A. D. A. Broadens Scope of Work in Its New Program

Rules More Stringent and Activities Include Many New Services to Dealers

ST. LOUIS, Mo., Feb. 12—Ten automobile dealers of St. Louis who have qualified for membership in the new "One of a Thousand" plan of the National Automobile Dealers' Association, will save \$25,000 a year on one feature of their membership alone, according to a statement by Harry G. Moock, general manager of the association. Similar savings will be effected virtually for every new member of the association, the association announces, in every part of the country.

Stringent requirements are exacted by the association for membership under the new plan. First an applicant must be endorsed by three dealers already a member of the association. Then the association will conduct an investigation of the dealer and submit its report to a membership committee. The identity of the membership committee will not be made public. The applicant must have been in business not less than two years, must have a credit and financial rating, a reputation for honesty and fair dealing in his community and must hold a direct franchise for the sale of new motor vehicles and own and operate his own service station and parts department.

Continuation to be More Exacting

Continuation of membership will be even more exacting. The directors provided that a member may be expelled for bankruptcy or insolvency, habitual failure or refusal to pay his debts, for any fraud upon either the association, its members or the public, publication of any false or misleading advertising, disparagement of any competitor, his merchandise or policies, loss of credit rating or financial standing.

The association is now putting in for its members an insurance department. It will give to each member the protection of the William J. Burns International Detective Agency, install an advertising bureau which will write dealer advertising copy and distribute it to its members, enlarge the activity of its freight audit bureau, and begin a general campaign of education in behalf of the dealers of the country who have acknowledged their obligation to the public and pledged themselves to abide by the association's standard trade practice.

CLEVELAND TRACTOR CO. TRUCK

Cleveland, Feb. 13—The Cleveland Tractor Co. is preparing to bring out a three-quarter ton truck.

Old Hares Motors, Inc., is Succeeded by E. S. Hare, Inc.

New Company to Act as Manufacturers' Agents, Sales and Engineering Experts

NEW YORK, Feb. 12—A new company known as E. S. Hare, Inc., has been organized to succeed Hares Motors, Inc. It is headed by Emlin S. Hare and most of his associates will be men who have served in the old company. The most important change is in the election of H. B. Lewis, formerly in charge of the advertising, as vice president to succeed Henry Lansdale. The engineering department will continue with H. D. Church as vice president in charge of that branch of the business.

The new company will act as manufacturers' agents, sales and engineering experts. It will retire altogether from the manufacturing field and devote all its energies to merchandising. The company now has charge of the sales for two truck manufacturing companies.

The identity of E. S. Hare, Inc., will not appear in any of its activities so far as the public is concerned. It is the purpose to take over the sales departments of the companies with which it makes contracts, designing of sales policies and taking over distribution.

Stewart-Warner Gets Rights In Seager Patent Settlement

Chicago, Feb. 11—Settlement between the Stewart-Warner Speedometer Corp. and Seager-Harrington interests in the suit recently brought against Stewart-Warner for infringement of underlying vacuum gasoline tank patents, has been made.

The settlement was reached out of court for \$441,678 by which the speedometer company is to have exclusive rights to the vacuum tank patents.

The position of Stewart-Warner is said to be very favorable at the present time. The volume of business during January and February was the largest in the history of the company. Orders have increased materially since the New York and Chicago shows and officials of the corporation are optimistic for the future. The company is said to be developing several new accessories, one of which is an indicator for the dashboard that will register the amount of gasoline received when a supply is bought at a service station.

MACAULEY DENIES NEW PACKARD

Detroit, Feb. 13—Alvin Macauley, president of the Packard Motor Car Co., today gave out this statement:

"The news item that a new Packard single six model is to be announced this month is absolutely untrue."

This news item appeared in MOTOR AGE February 9.

Brace Succeeds Hay; Vane Succeeds Moock in N. A. D. A.

ST. LOUIS, Feb. 13—At a called meeting of the directors of the National Automobile Dealers' Assn. held here today;

Thomas J. Hay, of Chicago, resigned as president of the association and W. J. Brace, of the Hudson-Brace Motor Car Co., Kansas City, was elected to succeed him.

Hay said that his personal efforts were too much involved in Chicago and Illinois association affairs to permit him to give the time needed to the national association.

Harry G. Moock, secretary-manager of the association, resigned to become director of the department of merchandising with the Hudson Motor Car Co. and the Essex Motors Co.

C. A. Vane, general counsel of the association, was elected to succeed Moock.

PACKARD LOWERS PRICES

Detroit, Feb. 13—On its twin-six line the Packard Motor Car Co. has made reductions on one model of as much as \$1400. The new prices compared to the old are as follows:

	Old	New
Duplex coupe and coupe.....	\$6600	\$5240
Touring, phaeton, runabout	4850	3850
Sedan, duplex sedan.....	6800	5400
Limousine	6650	5850
Chassis	4200	3450

Reductions are also made on two models of Packard trucks:

	Old	New
E C	\$3500	\$3100
E X	4000	3500
E D	4100	.....
E F	4500	.....

GARFORD PRICES DROP

Lima, Ohio, Feb. 12—The Garford Motor Truck Co. has reduced prices on its three largest models. The list follows:

	Old Price	New Price
3½-ton	\$4300	\$3750
5-ton	5200	4500
7½-ton	5500	5200

MIDWEST UTILITOR REDUCES

Indianapolis, Feb. 12—The Midwest Engine Co. announces that the price of its model 501 walking type utilitor has been reduced from \$345 to \$295 f.o.b. Indianapolis. The riding type of utilitor has been reduced from \$390 to \$340.

DEERE & CO. REDUCES TRACTOR

Moline, Ill., Feb. 11—Deere & Co. has reduced the price on its tractor, Waterloo Boy model N-12-25, from \$1450 to \$675. This price includes the tractor fully equipped. As in other cases of tractor price reduction, the company de-

clares that there is no justification for the reduction based upon the present cost of production.

WALLIS TRACTOR PRICE DOWN

Racine, Wis., Feb. 10—The J. I. Case Plow Works Co. has reduced the price of the Wallis tractor from \$1600 to \$995. This price includes a three-bottom Case tractor plow.

CADILLAC PHAETON PRICE

The attention of MOTOR AGE has been called to an error in the Jan. 12 issue as to the price of the Cadillac phaeton. The price was given as \$3,100 but should have been \$3,150.

ATWATER-KENT PRICES

New prices on the Atwater-Kent ignition for Ford cars including all cables, fittings and special resistance unit is \$11.75. When Ford magneto is used one vibrating coil is used leaving three for emergency.

OLYMPIC TRUCK LOWER

Tacoma, Wash., Feb. 12—The Olympic Motor Truck Co. has reduced the price of its truck, a 2½-ton model, from \$3,500 to \$3,200.

TRACTOR CHAIRMEN NAMED

Chicago, Feb. 13—The following committee chairmen have been appointed by the tractor and thresher department of the National Association of Farm Equipment Mfgs.: Tractor demonstration show and publicity, H. H. Bates, Bates Machine & Tractor Co.; foreign trade, J. B. Bartholomew, Avery Co.; tractor tests, R. C. Brewsough, Allis Chalmers Mfg. Co.; educational work, John R. Myers, Geo. O. Richardson Mfg. Co.

Special Course to Be Built for European Grand Prix

**Prizes for Great International Race
in September Said to
Be \$100,000**

PARIS, Feb. 8.—(By mail)—One million liras (\$1,200,000) are going to be spent on the construction of a 6-mile speedway in the suburbs of Milan, to be used for the first time for the European Grand Prix race next September. This speedway will make use of existing roads to a certain extent, but the whole of the ground will be private property and, unlike other European races, it will be impossible for spectators to secure free admission. The roads will vary in width from 26 to 52 ft.

A group of Milan merchants is responsible for the construction of this track, the detail work being entrusted to Commandatore Mercanti, who last year was responsible for the creation of the special speedway near Brescia. Although entries were small, the Brescia race was a complete success, for Mercanti secured the presence of the King of Italy and all the leading members of the government.

It is guaranteed that the Milan track will be ready for the series of races to be run next September. The events will comprise long-distance races for 2 and 3 litre cars and also for light cars of 1½ litres piston displacement. For the big cars cash prizes of 500,000 liras (\$100,000) are promised. These races will be open to all comers, and for the first time since 1914 German cars will come into racing competition with machines of allied construction. Full teams are promised from Benz, Mercedes and Opel. Allied nations certain to race are Italy with Fiat, Itala and Bianchi; England with Sunbeam, and France with Rolland-Pilain, Bugatti and Mathis. Undoubtedly the Milan race will be the most important speed test to be held in Europe during the 1922 season.

DUNKLE ASSETS \$2500

Columbus, Ohio, Feb. 14—Attorney L. M. Sandles, receiver for the C. T. Dunkle Motor Co., has ascertained the physical assets of the company to be appraised at \$2500. The liabilities are approximately \$65,000. Other assets in the form of book accounts are unknown, but will not amount to a great deal. The receiver is liquidating the affairs of the company as rapidly as possible.

ILLINOIS TRACTOR CO. SUIT

Bloomington, Ill., Feb. 10—Stockholders of the Illinois Tractor company of Bloomington, have filed suits against the officers and directors, demanding an accounting. The directors named include George Heberling, Dan F. Garber, B. F. Sprankle, George Mecherle, Charles I. Will, Paul F. Beich, D. D. Leary, and E.

J. Sweeney. It is alleged in the bill of relief that instead of the surplus of \$121,629 which the defendants alleged to have existed on June 1, 1920, that there was a deficit of \$695,470, without taking into consideration some \$200,000 worth of notes carried on the books as assets which the complainants believe are worthless.

The orators assert that the books show a loss in the first five years of operation of more than \$150,000. The company was organized in 1912 with a capital stock of \$100,000. This was later increased to \$2,500,000. The original capitalization represented \$50,000 in stock and an equal amount in patent rights.

Parts Makers' Orders Large and Inquiries Are Numerous

New York, Feb. 10—The volume of new business received in the past two weeks by parts makers has been larger than at any time for several months. Not only are substantial orders actually being placed but the large number of inquiries received indicate that a larger business is in prospect for the near future.

Large orders for supplies are being placed by the Gray Motor Corp. and by the Rickenbacker Motor Co. It is understood Gray is buying on the basis of 20,000 cars.

In consequence of the sales which the last fortnight has brought, the parts makers are more optimistic than they have been for some time although they have no expectation of doing anything like a capacity business this year.

BORDINO TO DRIVE FIAT

Los Angeles, Feb. 10—Enrico Bordino, premier Italian speed king, will drive a Fiat in the Washington's birthday race at the Beverly Hills speedway. He will have the 183-in. car which he drove in the Italian Grand Prix at Brescia making a speed of 186 kilometers an hour.

Jimmy Murphy, another entrant in the Beverly classic, has been notified by the French Grand Prix committee that the gold medal awarded him for his victory in that event last summer will not be forwarded to him, because of French laws governing the export of gold. The Automobile Club of France has offered to send Murphy the dies, so that he could have a medal struck off in this country at his expense. Murphy does not intend to send for the dies. He desires the medal but not to the extent of buying it.

KELSEY PLANT OPENS

Newark, N. J., Feb. 12—The first unit of the new factory of the Kelsey Motor Co., which will manufacture the friction drive Kelsey car, has been formally opened. About 100 six-cylinder Kelsey cars are now in use and the company announces that it will add a four-cylinder line with a touring car selling at \$985.

Dealers Declare Chicago Show Best Ever Held Locally

**Larger Attendance, More Sales and
Brighter Prospects Mark 22nd
Annual Exhibit**

CHICAGO, Feb. 11—With rare exceptions, reports from Chicago dealers and distributors on the automobile show, which closed here Feb. 4, are that it was the best show in points of sales, public interest and good business ever held. On every hand such reports as, "It was the best show we ever attended," "We did more business than ever before," "The show gave us the best list of prospects we ever had," "Enough prospects to keep us busy for months," are the expressions from dealers.

As at no other show the public showed its attitude toward the automobile industry. There was confidence in the orders signed and even a greater expression of it in the promises that are going to be turned into sales before the season is old.

Thomas J. Hay, newly elected president of the National Automobile Dealers' Assn., and president of the Chicago Automotive Trades Assn., expressed his views of the show as follows:

"The Chicago show proved that there can be cooperation in automobile shows. When the Chicago dealers decided to lend their aid to the better conduct of the show, some doubt was shown but we went ahead with instruction to salesmen and our plan proved itself of value beyond anything that we had hoped. As a result of the Chicago idea of instructing salesmen in the manner in which they should handle the public, we secured more sales than ever before and the prospects, conservatively numbered at 35,000 to 40,000, are the richest in sales promises that we have ever had.

"As I see it there is very little to criticize in the Chicago show. We had 'prospects' visit all the exhibits and daily reports were returned on the conduct of the attendants in the various booths. Common at all shows, but less common at this show than ever before, was the practice of salesmen to get together to listen to a 'story' or some other gossip. There were but very few reports of inattention and these were soon remedied. Because of the \$50 daily prize offered by the Chicago Automotive Trades Assn. every salesman was on his toes and this fact accounts for the large volume of sales and the splendid list of prospects.

"The absence of factory representatives at Chicago was noticeable. They were in Chicago but in most cases they were hidden away in some hotel where it was a real hardship to find them. I think this practice, especially common on the part of factory men with respect to the Chicago show, is all wrong. These men should be present on the floor of the show and in every way give their

influence and support to the dealer. The boss should be on the job.

"I attribute the intense interest in the Chicago show to the fact that there was more to see this year than ever before. There were new models, body changes, chassis improvements and refinements in countless number. The public appreciated this effort on the part of the makers and sales prove it."

While sales at Chicago were well distributed over the entire line of cars shown, the heaviest sales fell to the cars selling around \$1,200 and under.

HILLMAN CO. WINS SUIT

Los Angeles, Feb. 12—A patent infringement suit has been decided by Federal Judge Benjamin F. Bledsoe covering the patents on an automobile rain and sun shield known to the trade throughout the United States as the National Windshield Visor, an adjustable visor to fit open cars. The Hillman Mfg. Co. was organized and equipped in Los Angeles to make the new device.

Subsequently the Rain-Sun Vision Shield Co. of Los Angeles commenced the manufacture and sale of a visor practically identical with that invented by Hillman.

The court held that on the evidence Hillman was the one who had invented the visor and it was copied by defendant. The case is an important precedent assuring that local industries founded on valid patents will be protected by the courts.

An important feature of the case to automobile jobbers and dealers throughout the country who have handled the Rain-Sun visors lies in the fact that they will be responsible for, and obliged to pay, any part of the damages awarded that defendant fails or is unable to pay.

FORGER IS SENTENCED

Dallas, Tex., Feb. 10—T. E. Gray, formerly of Dallas, and one of the leading automobile men of this city, entered pleas of guilty in nine cases of forgery at Ft. Worth this week and was given three years in the penitentiary. Gray was given a like sentence here some months ago on charges of forgery. It was claimed Gray forged bills of lading, etc., and defrauded banks and others of Dallas and Ft. Worth out of more than \$100,000. At Dallas, Gray got three years. In the Ft. Worth court it was agreed the sentence should be made concurrent, which means Gray must serve six years in the penitentiary.

DODGE SALES INCREASE

Detroit, Feb. 10—Sales of Dodge Brothers' cars have been stimulated materially by the price reduction announced last week. Telegrams are being received at the factory from dealers in all parts of the country asking for shipments larger than those called for in their contracts. The dealers are urging that production be speeded up to make possible early deliveries.

Moral Hazard Is Applied by Big Company to Risks

Insurance Concern Adopts Contention of N. A. C. C. by Dividing Business Into Six Classes

NEW YORK, Feb. 12—One of the largest automobile underwriting companies has decided to divide its automobile policy holders into six classes this year in order to decide just what class of policy holders yields the most favorable experience. This plan is a practical application of the contention of the insurance committee of the National Automobile Chamber of Commerce that the moral hazard should be given greater consideration by insurance companies.

The announcement of the company in reference to the classes into which it has divided its policy holders follows:

1—High grade business men with income of \$5,000 a year or more. In this class will be placed only substantial, solid business men who are connected with growing concerns and not experimenters or speculators.

2—Laborers, mechanics, and workers of various kinds with an annual income of about \$2,500. Placed in this class principally, is union labor.

3—Those using their cars in their daily work, i. e., doctors, salesmen, etc.

4—Farmers, and ranchers, and dairymen, etc.

5—The young, unmarried men, clerks, and all who have not yet arrived, so far as a permanent business connection is concerned.

6—The undesirables that we are forced to write for one reason or another. All risks that from the start are not good will be placed in this class.

ALBERT R. WARNER DIES

Cleveland, Feb. 12—Albert R. Warner, for years an official of the White Motor Co., and known in the motor industry of the country as one of the leaders, was buried here Jan. 24. Mr. Warner died at the age of 54, after suffering a sudden stroke on Jan. 23.

For 17 years he had been with the White Co., in an official capacity. His service played an important part in the upbuilding of that corporation.

Mr. Warner until recently had been a member of the auxiliary board of the Guardian Saving & Trust Co., a director of the Cleveland National Bank and of the Universal Crane Co. and the Rubay Co., which builds automobile bodies.

GARAGES NOT INCLUDED

Springfield, Ill., Feb. 10—The Illinois Commerce Commission has notified the Illinois Automotive Trade Assn. that it will not enforce the law which was adopted by the last legislature which requires institutions engaged in the business of

storing personal property for hire, to pay an annual license fee of \$25. It is believed that this law was intended to apply to storage warehouses and not to public garages. Many bonding houses have circularized the garages of the state, quoting the law and suggesting that they take out a bond as stipulated by the statute. Garages, however, are not to be asked to pay a license fee nor file a bond.

Northway Returns as Head of Motor Truck Company

Boston, Feb. 12—Ralph E. Northway, who recently severed his official connection with the Northway Motors Corp., has returned to that company as president and general manager. His election followed the resignation of James F. Cavanagh as president and general manager, and James F. Finneran as secretary and treasurer. Cavanagh was elected chairman of the board of directors, a new office, and William W. Caswell was elected a director, secretary and treasurer.

Caswell is treasurer of the Arthur D. Little Co., Inc., of Cambridge, and vice president of the International Abrasive Co. He has a high financial standing in Boston.

Northway is the designer of the motor which bears his name and is regarded as one of the most valuable assets of the Northway Motors Corp. After he resigned his official connection with the company he became associated with other interests in the purchase of the Harley Co. from the Hendee Mfg. Co. It is assumed he will retain this interest.

TRADE TO MOLD CANADA LAW

Toronto, Feb. 10—At the fifteenth annual meeting of the Ontario Motor League, Tuesday, the largest gathering of motorists ever held in Canada, some two hundred members of the trade and industry were among the guests at the banquet and entertainment. It was decided that the league would vigorously combat the proposed gasoline tax of one cent a gallon, press for the enforcement of the antiglare law, seek to secure legislation legislating the use of spot lights with a heavy penalty for their abuse and to make the lights on all vehicles low provincial in scope. Mutual insurance is to be investigated.

BENZ-GAGGENAU HERE

New York, Feb. 12—The latest models of the Benz-Gaggenau truck, just imported from the factory, are being shown by Benz & Cie, Inc., United States distributors. The line comprises four chassis ranging from one ton to five tons. The four and five-ton models are chain driven and the others shaft driven. Bodies to suit any purpose are supplied. The company also makes double deck buses, fire apparatus and a tractor. The American agency will maintain a service station.

Business Trend Is Upward in Middle South Section

Cotton Belt Prospects Seem Especially Good—Mills Short and Prices Look Higher

NEW YORK, Feb. 10—An investigation of the automotive market made by MOTOR AGE in various sections of the middle south indicates that business will remain on the up-grade from now on. This seems to be particularly true in the cotton belt because mills actually are short of cotton and the present price is likely to go even higher, which will add to the prosperity of the territory and also have an important psychological effect.

It seems to be the general belief that any companies which contemplate establishing southern branches would be wise to do so at this time in order to establish themselves on a solid footing and be ready for business when conditions improve.

Automobile sales for the last three months in the Atlanta district have been much better than in the three months preceding and were somewhat better than the same months of 1921. Accessory sales, however, remain about stationary and most of the accessory dealers are rather heavily stocked. They are buying on a hand to mouth basis and have been for more than a year.

While no material improvement is expected in the Atlanta district for the first half of 1922, all indications are that it will be better than in the same period of 1921. Conditions in other lines are steadily improving and the second half of the year will be considerably better if there are no crop failures.

Dealers in the St. Louis district report that sales for the last three months have shown a marked improvement in passenger cars, trucks and used cars. By intensive selling methods accessory dealers have been able to bring their stocks down to a satisfactory basis and few of them are overstocked. As a consequence they are buying liberally for future needs.

In general, the feeling in the automotive trade in the St. Louis section is more cheerful than it has been for a year.

Many representative automobile dealers in the Louisville district did a volume of business in 1921, which equalled the record breaking year of 1920. Profits were not quite so large, however, because of the lower list prices. Sales for the last three months have been much better than in the same period last year. Accessory dealers are not carrying over larger stocks but are buying only to meet immediate needs.

It is expected that the first half of this year will bring a business equalling the first six months of 1921 in the Louisville territory, while the second half is

expected to show a considerable increase over the previous year.

Sales for the last three months in North Carolina have been about on a par with the other months of the year but considerably less than 1921. Accessory dealers are carrying small stocks, but they show no disposition to buy liberally. Business for the next few months is expected to be slow, especially for cars selling for more than \$1500. No other marked improvement is expected before the latter part of the year. The used car situation is unfavorable.

Sales in the Birmingham territory have fallen off a trifle in the last three months, but have been on about the same basis for a year. Accessory stocks are rather short but dealers are buying only for their immediate needs. No great increase in business is expected for the first quarter but sales are expected to increase in the second and third quarters with a very slight falling off in the fourth quarter. It is believed that cars of southern manufacture will have a slight turn for the better as they are establishing better sales connections.

Buffalo Dealers Decide to Eliminate Trade-Ins

Buffalo, Feb. 10—Fifty per cent of the automobile dealers of this city have decided to discontinue trade-ins.

Many of these have discontinued accepting used cars as part payment for new automobiles as a temporary expedient with the view of making it permanent if trade conditions, yet to develop, warrant their doing so.

It is safe to assume, however, that none of them will trade until their present stocks of used machines are disposed of or are largely decreased.

"Sell your car, yourself, and bring the money to us as part payment on a new automobile" is the advice of the dealers to prospects.

Some of the dealers who are refusing cars in trade offer to finance sales of used cars provided those wishing to trade them in find purchasers for them.

Inquiries made among local dealers indicate an encouraging upward trend in business here since Buffalo's successful automobile show.

Every dealer, who had cars on exhibition, garnered a big crop of prospects at the show and salesmen have been busy since converting these potential buyers into car owners. Many sales have been prompted by the fact that Buffalo ever since the show, has been having fine weather with little snow.

Truck sellers report business lively and the outlook encouraging and the accessories dealers express themselves as well pleased with the results of the "Ask 'Em to Buy" campaign which they have been carrying on ever since they listened to the inspiring talk delivered by Ray W. Sherman at the automobile show.

Investigation of Bosch Sale Touches Several New Angles

Department of Justice Goes Into Contracts, Taxes and Transfer of Company

BOSTON, Feb. 10—The scope of the Department of Justice investigation of the sale of the Bosch Magneto Co. was learned coincident with the arrival here of Thomas W. Miller, alien property custodian, with government records of the transfer. The documents were discussed at a conference of Federal attorneys held with the view to preparing the information contained in them for presentation to a Federal grand jury.

Officials indicated that the investigation would follow three main channels. The first of these is the sale of the Bosch Magneto Co. by A. Mitchell Palmer, as alien property custodian, to Martin E. Kern. In this connection, it was said, the question of Kern's citizenship at the time of the transfer is involved.

The government is interested also, officials said, in looking into the Bosch company's contracts with the army air service, involving \$420,000.

The third phase under investigation, it was said, involves income tax returns filed by the company. Internal revenue agents are understood to be checking up these returns now.

The case will come before the Federal grand jury here. John E. Joyce, assistant Federal attorney for the southern New York district, will have charge of the investigation of the sale of the company under the direction of District Attorney Harris.

The case is before the Federal grand jury of this district at the present time, as it was summoned for the purpose several weeks ago. After a few sessions the jury was dismissed, subject to call at any time. The delay, it is generally understood, was to give the government authorities time to check and audit the records of the company and of the alien property custodian.

The Bosch property at Chicopee, Mass., was seized in April, 1918, by Palmer, as alien property custodian, being sold eight months after to Kern for \$4,500,000. Allegations that the property transferred, including stock in other concerns and trademarks, was worth a much larger figure and that something was not right about the sale, were made and investigated when Palmer's nomination as United States Attorney General was before the Senate for confirmation.

It is declared that Joyce has been allowed carte blanche in this case with instructions to bare all the facts.

COMMERCE HAS NEW BUS

Detroit, Feb. 14—The Commerce Truck Co. is preparing to go into production on an 11 passenger motor bus built along the lines of a passenger car. This bus will have four seats.

Eight States Outline Laws to Place Tax on Gasoline

Mississippi Bills Call for State and County Wheel Tax—Vir- ginia in Line

NEW YORK, Feb. 12—Indications now are that several additional states will align themselves this year with the 15 which already have imposed taxes on the sale of gasoline. The present tax is one cent a gallon in all states except Oregon where it is two cents.

Legislation calling for a gasoline tax already has been taken up by eight more state legislatures. In some instances several bills have been presented covering the same general subject.

A bill which will be offered in Maryland by the administration, will call for a gasoline tax to wipe out an old deficit resulting from highway construction. It will not be opposed by the motoring interests because it has been stipulated that this tax will be in lieu of all other automobile taxes. The danger is, however, that the present administration cannot bind later administrations to keep its terms.

Two bills have been presented in Mississippi. One calls for a state tax and the other would authorize counties to impose a tax together with a wheel tax. The state bill would impose a tax of one cent a gallon together with special taxes on distributors and dealers. Two bills also have been presented in Virginia. One provides for a straight tax of one cent a gallon and the other for a tax of two cents a gallon with an impost of \$25 on distributors and \$5 on dealers.

Other states which propose an excise tax on gasoline are Massachusetts, Nebraska, New Jersey, New York, Rhode Island and South Carolina.

Dunlop Rubber Postpones United States Production

Buffalo, Feb. 10—Hope for early activity at the big plant of the Dunlop Tire & Rubber Corp., in River road, is again deferred by a statement issued with the sanction of Parry D. Saylor, vice president. Regarding rumors of changes in organization here and of immediate resumption of operations, Saylor said that the whole subject was covered in the statement, which reads as follows:

"Prevailing conditions in the international rubber market have prompted the Dunlop Tire & Rubber Corp. to postpone the resumption of activity at its American plant.

"It had been hoped that operations would get under way during the present winter and spring, but the directors of the company have decided, after a careful survey of conditions, not to seek 1922 business. The construction and equipment work necessary to put the plant into a production sufficient to oper-

ate on a profitable basis could not be accomplished before the best of the season's business had already passed.

"Further developments are, therefore, postponed until such date as will permit the company to take such advantages as an early start for 1923 may provide."

It was reported at the plant that members of the present staff may be called to England for service in the parent company during the interim. The engineering and factory force will be retained in Buffalo, in order to protect the plant and keep all the machinery and equipment in good order.

Dodge Production Raises to 550 Cars Since Big Shows

Detroit, Feb. 12—Production at the Dodge plant, which has been running at 550 daily since announcement of its price reduction, will be increased to 600 daily before March 1. Preparations are being made by the company to manufacture its own open bodies and they will be brought out in June or July. Dies and equipment now are being installed in the body unit of the plant. The company previously has manufactured its enclosed bodies.

The Ford Highland Park plant is operating on a basis averaging four days a week. Some departments are running more and some less. Production in some of the plants manufacturing cars in the Dodge price class has fallen off temporarily.

Cars in the medium priced class are moving slowly towards larger production with no special make taking precedence and none lagging notably.

ELECTRIC AUTOMOBILE SHOW

New York, Feb. 12—The invitation of the New York Edison Co. to hold the 1922 electric automobile show in its Irving Place show rooms has been accepted and the date for the exhibition set for April 3-15. The show will be divided into two parts, the first week including passenger cars and street trucks while the second week will be devoted to industrial trucks.

Wills Sainte Claire Dealer Luncheon in Chicago During Show Week



GMC Laboratories at Dayton Deny Gasoline Substitute

Tellurium, Researchers Say, In- creases Mileage, But Adds Knock to Engine

NEW YORK, Feb. 12—Considerable excitement was caused in speculative circles last week by a United States Press dispatch from Dayton which said that "discovery of a tellurium gasoline compound which increases automobile mileage 100 per cent over the present gasoline fuel was announced at the research laboratories of the General Motors Co." It was stated that the discovery was made some months ago by Thomas Midgley and Thomas A. Boyd. As a result of this report General Motors common stock went up a point or more.

The only trouble with the dispatch was that it was not given out at the General Motors research laboratories and tellurium is not designed to be a substitute for gasoline.

Midgley and Boyd have been working for many months on the theory that fuel mileage could be materially expanded by redesigning internal combustion engines so that the compression would be increased provided some element were added to the fuel which would take out the cylinder knocks.

There are several anti-knock materials of which di-ethyl telluride is one of the most effective. According to Midgley road tests have demonstrated that by increasing compression and using telluride an increase of from 80 per cent to 125 per cent in mileage can be obtained. This subject was discussed at the semi-annual meeting of the Society of Automotive Engineers last spring in connection with a paper by Fred C. Ziesenheim on "developing the high compression automotive engine."

The United Press dispatch naively added that the annual supply of telluride was only about 60 tons while 1,500 tons would be required to meet the annual consumption of gasoline.

BUSINESS NOTES

Hauck Mfg. Co.'s Philadelphia branch has opened new quarters.

Timken Roller Bearing Co., Canton, O., has leased a half floor in the Walker Power building, Windsor, Ont., which will be occupied as a site for Canadian production.

J. D. Grant, Inc., Fargo, N. D., announces a change of name to Grant-Dadey Co.

Kelsey Motor Co.'s plant at Belleville, N. J., is practically completed.

Visible Pump Co., Ft. Wayne, Ind., will shortly be taken over and put into operation by a new company.

Ahlberg Bearing Co. announces the opening of ten additional branches, making the total number now in operation thirty-four.

International Purchasing & Engineering Co., Detroit, announces that a 15 per cent reduction went into effect on all Van Dresser electric driven machines Feb. 1.

S. B. Waddell and Hugh Armstrong of Ft. Worth, Tex., recently patented the Standard piston ring, which they will manufacture at Weatherford, Tex.

Du Bois Rubber & Tube Co., Chattanooga, Tenn., recently opened its factory, giving Chattanooga its first rubber factory and the south its largest.

The Oshkosh Auto Jack Mfg. Co., Oshkosh, Wis., expects to engage new quarters immediately following the almost total destruction of its plant by fire. The damage is partly covered by insurance. William and Joseph Koeck are the principal owners.

The Advance Auto Body Co., Milwaukee, is a new corporation organized with \$110,000 capital stock to engage in the manufacture, repair and sale of motor car bodies of all descriptions. The incorporators are Julian Olds, John A. Dietrich and Howard T. Foulkes, all attorneys, in Milwaukee. No statement concerning the new company's plans is as yet available.

International Steel Products Co., Hartford, Wis., stockholders, authorized the directors to either sell the property or raise enough cash to carry the business forward at least another year. Recently the company entered several other lines of sheet steel production, the success of which in the next few months will determine the future of the concern.

Reliance Motor Truck Co., Appleton, Wis., manufacturer of Reliance motor trucks, is bringing out a new design of rotary snow plow, designed especially for clearing highways.

Reynolds Spring Co., Jackson, Mich., reported net profits of \$89,297.15 for the year ended Dec. 31, 1921, equivalent to 41.7 cents a share on the 73,500 shares of common stock. This is after providing for the full year's dividend requirements on the 7 per cent preferred stock, but before Federal taxes. In the year \$22,200 in preferred stock has been retired and cancelled.

Dodge Brothers' Chicago sales for January, 1922, were in greater volume than for any other month since last August.

A. E. Todd of the retail sales department of the Studebaker models has announced that he will open a branch at Cleveland, O.

Yellow Cab Mfg. Co. stockholders, at a special meeting, authorized the directors to declare and distribute a stock dividend of 100 per cent—50,000 shares—on the Class B common stock. The dividend will be payable early in March to stockholders of record Feb. 18. Two new directors were elected, Leonard S. Florsheim, president of the Kabo Corset Co., and Paul H. Geyser, manager of the company's automobile factory. Other directors were re-elected.

Tokheim Oil Tank & Pump Co., Ft. Wayne, Ind., elected officers and directors at a meeting recently. Reports made by the secretary-treasurer indicated a good year past and optimism regarding the new year was expressed.

Holt Co., East Peoria, Ill., is not liable to Julius Schnerb and his partner, Adolph Wegiment, Frenchman, for war commissions totaling \$3,000,000, according to Federal court decisions in New York. The case was taken from the jury and dismissed upon completion of the plaintiff's testimony.

American Metal Products Co., of Milwaukee, which recently completed a new works, is enlarging its line of production, heretofore confined to bronze and brass ingots, castings, tearing metal, etc. One of the latest additions to the line is a poppet valve and stem for car and truck engines, made from Ampco bronze, a patented metal alloy.

Nash Motors Co., at Milwaukee, on Feb. 1 resumed an 8-hour a day schedule, affecting about 400 men on the working force who have been for some time working mornings only.

The Safety Traffic Light Co., of Milwaukee, has been organized by Walter W. Lange, prominent foundry owner, and Richard F. Downey, to manufacture Downey's invention of a signal light for street intersections. This is similar in appearance to the present "mushroom" type of crossing light, but it is so designed that if struck or passed over by a vehicle, the dome sinks to the street level and springs back into position.

Wilcox-Bennett Carburetor Co., Toronto, Ont., has been incorporated with a capital stock of \$100,000 and a debt limit of \$250,000. A. C. Bennett is president; H. M. Bennett, vice president, and R. D. Wilcox, secretary-treasurer.

Automobile Underwriters of America headquarters has been moved from San Antonio to Dallas. The company handles automobile insurance only and was organized at San Antonio twelve years ago.

Super Valve Mfg. Co., Chicago, including the entire plant, patents, good will, inventory, etc., has been purchased by The Trindl Company, 2917 S. Wabash Ave., Chicago, Ill., and will be marketed by The Trindl Co. along with their piston pins.

Tel-Auto-Spark Co., St. Louis, Mo., has been organized in St. Louis and has opened offices in the Pohtiac building, to sell the Tel-Auto-Spark. This is a device by which connections with the cylinders are maintained to a clock face on the instrument board and the sparks on this clock face indicate which cylinders are not sparking. The idea is to eliminate, through this device, much of the search for electrical troubles. The device sells for \$20, installed.

and branch managers. Among the prominent workers for better roads are J. G. Shirley of American Motors, distributing White and Chevrolet; Alexander H. Mohler of Mohler & De Grass, Cadillac, Willys-Overland and G. M. C.; S. F. Fuller of Oldfield Tires, and S. L. Carrico of United States Rubber. They are working at present to get an automobile highway built from Mexico City to Laredo.

The automotive men also are at work on plans for their second annual show, to be held in the National Theater April 16-23. In connection with the planning of the exposition they heard an address Feb. 8 on show management as it is conducted in the United States, by Fred H. Caley, manager of the Cleveland show and president of the National Assn. of Automobile Show and Association Managers.

Texas January Sales Show Strong Lead Over Year Ago

All Branches of Industry Benefit in Prosperity of State's Agricultural Prospect

DALLAS, Tex., Feb. 10.—While complete reports have been made there are indications that the retail automobile business in Dallas and virtually all northern Texas for the first month of the year showed an increase over the closing month of the last year. From a dozen retailers in Dallas it was indicated the increase would be about 10 per cent. The retailers believe the reduction in prices had a considerable amount to do with the increase in business. One feature of the business was the majority of sales made were on a basis which will enable the dealer to have the banks handle the paper. The cash payments, where the deal was not all cash, showed an increase over the figures of last year.

The retailers enter the second month of the year with optimistic views. They claim the prospects are brighter because money is easier and the farmers are expecting bigger crops.

Dealers reported a considerable number of second hand cars moving at satisfactory figures.

Truck men declare their business has slightly increased and that the outlook is brighter. Tractor dealers reported increased business over the last month, but said their sales are still far from the volume during the banner months of 1920. They believe with the farmers expecting good crops the business will be steady throughout the year.

Accessory dealers said their business was holding its own with prospects of getting better. The accessory men say the retailers are selling more cars and trucks and that naturally meant more business for them. Tire men were optimistic and reported business about normal. Garagemen appeared to have about all they could do. Generally, there had been reductions in prices of tires, parts, accessories and repair work.

CANADA CALLS FENN

New York, Feb. 10.—F. W. Fenn, secretary of the motor truck committee of the National Automobile Chamber of Commerce, left Monday night for Montreal where he conferred yesterday and today with the automobile interests of the province in regard to legislation which has been proposed to restrict the use of trucks of more than 3½ tons capacity. Fenn's advice on this subject was asked because of the limited experience Canada has had. Conferences were arranged for him with the heads of large transportation companies, dealers and the government automobile bureau.

Fenn delivered addresses to the students of Toronto University on the subject of highway transportation.

Automobile Men Open Drive in Mexico for Better Roads

Mexico City, Feb. 6.—The automotive division of the American Chamber of Commerce has undertaken an active campaign, through the newspapers and other forms of propaganda, to educate the Mexican public on better highways. Outside the large cities, the average Mexican thinks of a road as a trail and while President Obregon and government officials generally have put themselves on record as strongly favoring highway improvement, they must have public understanding and support of the subject before they can even begin to talk of appropriations.

The automotive division of the American Chamber is composed of automobile, truck, equipment and tire dealers,

Old Timers' Club to Found Sections in Principal Cities

Election at Chicago Leaves Organi- zation in Best Condition Since Its Beginning

CHICAGO, Feb. 10—Officers for 1922 were elected by the Old Timers' Club at the annual election and banquet held at the Congress Hotel, Chicago, Tuesday evening, Jan. 31. The nominating committee appointed at the New York meeting of the directors drew up a very strong ticket, and, as no opposition ticket was placed in the field the election was made unanimous. The newly elected directorate then elected William L. Hughson, of San Francisco, president, F. Ed Spooner, secretary, and J. Edward Schipper, field editor of the Class Journal Co., treasurer. The vice presidents, who are also the directors, were elected from a strong working organization. They are as follows:

List of Vice Presidents

Captain E. V. Rickenbacker, vice-president, Rickenbacker Motor Car Co., Detroit; E. C. Morse, director of sales and advertising, C. H. Wills & Co., Marysville, Mich.; Harry Branstetter, Chicago; Ralph Hamlin, veteran distributor of Franklin cars, Los Angeles, Cal.; Geo. T. Briggs, sales manager of Wheeler & Schebler, Indianapolis; Harry W. Anderson, general sales manager, Duesenberg Motors Co., Indianapolis; Chester I. Campbell, veteran manager of the Boston automobile shows; Horace De Lisser, Ajax Tire & Rubber Co., New York; George W. Hanson, president Hanson Motor Car Co., Atlanta, Ga.; Louis Block, president Philadelphia Automobile Trade Association, Philadelphia, Pa.; E. E. Peake, secretary-treasurer Kansas City Motor Car Dealers' Association, Kansas City, Mo., and the following directors who hold over:

Hold-Over Directors

Lloyd Maxwell, Erwin Wasey & Co., Chicago; Thomas J. Hay, Chicago; Walter Birmingham, automobile editor Chicago Evening Post; Martin L. Bulcher, vice-president and general manager Federal Motor Truck Co., Detroit; Richard Kennerdell, Franklin, Pa.; Albert Champion, Champion Ignition Co., Flint, Mich.; Gregory Flynn, New York, and John Younger, Standard Parts Co., Cleveland. The Old Timers' Club adopted the constitution and by-laws at the Chicago meeting and all members will be supplied with copies at an early date. This calls for good fellowship and the helping hand. The two banquets, New York and Chicago, the latter in the Gold room of the Congress Hotel, were the most successful show events of the national show weeks. The Chicago event was presided over by E. C. Morse, vice-president, and Captain Rickenbacker and

Albert Champion were among the speakers. Over 500 were present at Chicago. The Old Timers' Club will now proceed with the formation of sections in every main city of the United States and Canada in accordance with the constitution adopted.

Call for Mr. Blank's Automobile

DALLAS, Texas, Feb. 10—The Cox Department Auto Service House has been opened here. It is the first of its kind in the south. It is really an automobile hotel where cars are stored on three floors. But in connection with the "hotel" and operated by the company is a filling station, an accessory shop, a battery shop, a tire shop and a repair shop. The accessory and tire stores carry complete lines and the repair shop is equipped to do any kind of job. For the benefit of women customers, a club and rest room has been arranged and many of the women are utilizing the place for club meetings. The automobile hotel occupies five floors and a basement. A car is registered for storage like a guest registers at a hotel.

Several Truck Makers Favor Branch Plan to Distributor

New York, Feb. 12—Announcement by the Nash Motors Co. that it had decided to eliminate distributors in the sale of its trucks, emphasizes the trend in this direction. It is similar to that in the passenger car field but more pronounced.

The General Motors Truck Co. recently has established branches in Atlanta and Charlotte, N. C. It is understood the company will establish other factory branches from time to time.

The Republic Motor Truck Co. is supplanting distributors by factory branches and practically all the business of the White company and the International Motors Co. is handled through factory branches.

Some of the other truck companies, on the other hand, are strengthening their distributor organizations and signing contracts with some of those who have given up their former connections.

The companies which are expanding their factory branch organizations, contend that they are enabled in this way to give better service and they also can eliminate some of the evils which attend the taking of used trucks on trade-ins at more than their actual value.

COLE IS NEW SECRETARY

Chicago, Feb. 10—J. D. Cole, for ten years manager of the Chicago branch of the Pyrene Mfg. Co. of New York, has been appointed field secretary of the Automotive Equipment Assn. and assumed his new duties Feb. 1.

Healthy Stir is Noticeable in New York Truck Market

Many Inquiries from Fleet Operators Indicate Orders in March and April

NEW YORK, Feb. 12—The Metropolitan truck market is developing a stronger tone, especially in the heavy duty class. In the past two weeks there have been repeated indications that fleet owners and large users of trucks are preparing to come into the market again this spring after a lull of more than two years.

The demand is not indicated so much at the present time by actual sales as by the apparent desire of prospects and former customers to consider spring installations. Several of the large corporations which use heavy trucks are assuming a distinctly different attitude toward the overtures of salesmen and some are making inquiries concerning group purchases.

This more favorable attitude is taken to indicate a strengthening of business confidence and holds the promise of translation into actual truck sales in March and April.

Attitude Changes

The changing attitude of truck users is one that has been closely observed by the Metropolitan truck dealers. It is a matter of history now how the large truck users, with in some cases only half of their equipment in operation, closed the doors entirely against the addition of new equipment and how this, together with the competition from re-imported units, held the market stagnant for months.

There's another phase of the situation that lends a rosy tinge to the outlook. That is the fact that many of the heavy trucks in use in this territory today have been run to junk, through the curtailing of replacements, and thus the used truck will not be the factor in its field that the used passenger car has been.

Up to the present time this upward trend has not made itself felt in the light delivery car class. The purchasers in this class today, as in the past year, have been principally the small business man who is just changing from horse-drawn to motor-driven equipment, small stores installing delivery service and similar businesses.

Sales of motor cars in January were considerably better than the same month last year, and in most lines there is indication of a slowly increasing demand extending to the peak of the spring season.

The used car situation in the Metropolitan district is assuming more promising aspects with most dealers in and about New York gradually reducing stocks.

CONCERNING MEN YOU KNOW

Ben C. Mott of Chicago has been appointed manager of the Milwaukee branch of the Packard Motor Car Co., Chicago, succeeding Ray C. Chidester, who resigned Jan. 1, to become Durant distributor in Wisconsin and northern Michigan.

Arthur X. Mers, secretary, Madison-Kipp Co., Madison, Wis., a manufacturer of automatic lubricating devices, oil cups, etc., departed Feb. 4 from New York on the Empress of Scotland for an extended business and recreation tour. The principal objective is Moscow, where Merz will investigate conditions respecting the possibilities of tractor business.

George L. Willman, formerly assistant sales manager of the Chicago branch of the Studebaker Corp., has purchased an interest in the John G. Wollaefer Co., Milwaukee, distributor of the Studebaker in Wisconsin.

George H. Mueller, who, during the war, served as managing engineer of the Curtiss Aeroplane & Motor Corp., Buffalo, has become associated with the Pawling & Harnischfeger Co., Milwaukee, manufacturer of electric traveling cranes, machine tools, excavating machinery, etc., as general sales manager.

Cass G. Selden, until recently an executive of the Scripps-Booth Corp., has been named general manager of Joseph N. Smith Co., builders of automotive body hardware. Before joining Scripps-Booth Selden had been connected with Studebaker. George Rumford, production manager at Maxwell, resigned this position to become production manager at the Smith company plant.

C. L. Alexander has been appointed assistant sales manager of the Elgin Motor Car Corp., Argo, Ill. Alexander has been with the Elgin Co. for a little more than a year, in charge of sales promotion.

M. F. Smith, formerly manager of the Ford Motor Co.'s branch at St. John, N. B., has been appointed manager of the London, Ont., branch, succeeding W. H. Smith, resigned.

Harold L. Arnold, who has been distributor of Hudson cars in California, has signed a contract for the distribution, on the Pacific coast, of Woodbury tires, which will be manufactured in Chicago.

John N. Willis will leave Saturday for Palm Beach with his family, but after spending a week with them there will start an extended tour of the southwest, Pacific coast and mountain states.

Herbert A. Ruhnke, president, Federal Tire & Supply Co., Milwaukee, was elected president of the Wisconsin State Tire Dealers' Assn. Ruhnke is vice president of the Milwaukee city association. Walter E. Gnatzig of Whitewater, Wis., was elected vice president, and Sam A. Rowe, president, Republic Supply & Rubber Co., Milwaukee, secretary and treasurer. Rowe holds the same offices in the Milwaukee association.

Howard W. Harrington, advertising manager of the Moline Plow Co.; Henry Waterman, local attorney, and Walter Vom Bruch, an evangelist, were speakers at the recent meeting of the Henry County Automobile Trade Association. Intensive salesmanship and good road programs were topics of the meeting.

H. H. Seaman, president of the Seaman Body Corp., Milwaukee, and the W. S. Seaman Co., manufacturing passenger car bodies and specializing in enclosed types, was elected treasurer of the Moline Plow Co.; Henry Waterman, annual meeting. Herman A. Wagner, president, Wisconsin Bridge & Iron Co., was elected president; Richard P. Tell, president, National Brake & Electric Co., vice president, and Joseph McC. Bell, secretary and manager.

HUDSON SPECIALTY SALES PLAN

Philadelphia, Feb. 12—William F. Hudson, of the Hudson Motor Specialties Co., announced that he had developed a merchandising plan for the distribution of the Hudco-Ford transmission cover that will eliminate the regular jobbing establishment. This was undertaken, Hudson says, because of his realization that the jobber cannot give the proper attention to every new line, no matter how meritorious. So this plan has been developed to use local distributors on this specialty,

E. J. Hughes, formerly with the B. F. Goodrich Co., at Akron, in an executive capacity, has been made vice president and general manager of the Carter Motor Accessories Co. of Buffalo, N. Y., a company just formed for the manufacture and sale of automobile parts and accessories.

Edmund L. Babcock, New Haven, Conn., former city tax collector, and well known automobile dealer, died suddenly of heart trouble at his office here, Jan. 30.

Clifford Norwood, capitalist of Redlands, Calif., and Theodore E. Stolt, Long Beach millionaire, have been elected to the directorate of the Leach Biltwell Motor Car Co., of Los Angeles, builders of the Leach Power Plus Six and the Leach 9-99.

S. P. Thacher, technical assistant to the president of the United States Rubber Co., was elected chairman of the executive committee of the Tire and Rim Assn. for 1922. J. D. Anderson, factory manager of the Fisk Rubber Co., was elected vice-chairman.

H. J. Banta, sales and advertising manager of the Harco Battery Co., East Moline, Ill., has resigned to take a similar position with the Automatic Take-Up Nut Co., of the same place.

Herbert B. Einfeldt, assistant manager of the Milwaukee Tire & Supply Co., was elected president of the Automotive Credit Men's Assn. of Milwaukee at the annual meeting. George J. Brereton of the Shadbolt & Boyd Iron Co., jobber of automotive equipment, was elected vice president.

Herman A. Zannoth has been promoted to the position of plant engineer of the Cadillac Motor Car Co. He was formerly chief electrician.

John C. Hill has become a special sales representative of the Maxwell Motors Corp., in Mexico and Central America. He was formerly export manager of the Westcott Motor Car Co.

S. P. Whiting has been named secretary of the Motor Trades Bureau of the Des Moines Chamber of Commerce, succeeding James Bowsie, retired.

N. Scott Jorgenson has been appointed head of the sales department of the Girard Automobile Co., Peerless distributor, Philadelphia.

W. A. Hamill has been appointed sales manager of the Hatch Motors Co., Philadelphia, distributor of Marmon cars.

Alfred Reeves, general manager of the National Automobile Chamber of Commerce, left Feb. 4 for Atlanta, where he addressed the dealers' association Feb. 6. He spoke Feb. 7 to the dealers at Jacksonville, and from there went on to Daytona, where he will spend a week. Upon his return trip he will stop off at Camden, S. C., for a conference with Colonel Charles Clifton, president of the N. A. C. C.

E. A. Johnson has been appointed service manager of the Auburn Automobile Co., with offices at the factory, Auburn, Ind.

C. E. Mason, of Concord, N. H., has been appointed sales engineer by the Kelly-Springfield Motor Truck Co. This completes the new sales organization of the company.

Wiley Douglas has been appointed manager of the J. I. Case Plow Works Kansas City branch. Clarence Sneathen will assist him.

L. L. McAnney has returned to the management of the McGraw Tire & Rubber Co., Cleveland. With the exception of a few months, Mr. McAnney has been representing this company in Baltimore.

J. L. Justice, Buffalo, N. Y., has become associated with the Maxwell Motor Corp., and will serve as supervisor for the Cleveland district, which includes Ohio, West Virginia, and parts of Pennsylvania, New York and Maryland.

each distributor being assigned a definite territory.

The territories have been assigned to population and special sales suggestions are being distributed to the men working on this product.

The Hudson Motor Truck Co., affiliated with the Hudson Motor Specialties Co., is now developing a new line of motor trucks which will shortly be announced to the trade. Some novel merchandising plans are promised for the sale of this product.

Alcohol-Benzol Tests Are Steps to French Spirit Law

National Commission and Wine Growers Prepare Trials for Gasoline Substitute in April

PARIS, Feb. 8.—(By mail)—Following up the work of the National Commission entrusted with the task of finding a substitute for gasoline, an important group of wine growers at Beziers, in the south of France, announces practical trials of passenger cars running on alcohol and benzol for April 2.

Although the exact nature of the fuel has not yet been announced, for the technical commission is still trying out experiments, it is more than probable that it will consist of 50 per cent alcohol and benzol. The competitors will be given a limited amount of fuel, in proportion to the piston displacement of the engine and the weight of the car. A distance of 150 miles will have to be covered at minimum speeds varying from 25 to 38 m.p.h., according to piston displacement, the winner being the one covering the distance, at the regulation speed, with the lowest consumption of fuel.

While existing types of automobiles can be operated successfully on an alcohol-benzol mixture, the French technical commission does not consider the problem solved, for the various mixtures employed do not give quite the same results as gasoline, while many of them have injurious effects on metals. At the present time the Paris Omnibus Co. is running all its motor buses on a benzol-alcohol mixture, the only real difficulty being that this fuel corrodes valve seatings and stems.

By a law passed in the French Parliament last year the government has the right, at any time, to cause gasoline importers to mix 10 per cent alcohol with all fuel put on the market. This law has not yet been taken advantage of, but it gives the government power, merely by the signing of a decree, to make the use of alcohol obligatory with gasoline. This will constitute the first step towards compulsory alcohol fuel on French automobiles.

CANADIAN RETAILERS MEET

Toronto, Feb. 10—The fifth annual convention of the Automotive Retailers section of the Ontario Board of the Retail Merchants Assn. of Canada, closed here with the re-election of the 1921 officers for 1922, as follows:

President, J. J. Duffus, Petersboro, nt.; first vice president, S. Pink, tawa, Ont.; first vice president, S. Pink, Ottawa, Windsor, Ont.; third vice president, A. McDonald, Stratford, Ont.; secretary, W. C. Miller, Toronto, Ont.; treasurer, Frank McLaughlin, London, Ont.

The registered attendance was approximately 90, of which a score or more were jobbers and their salesmen, during the two days of the convention.

IN THE RETAIL FIELD

Collins Garage at Hornell, N. Y., was damaged to the extent of \$25,000 by fire on Feb. 1.

Stebbins, Inc., Milwaukee, has been incorporated by C. E. Stebbins, to become distributor of the Rickenbacher in Wisconsin. Headquarters will be opened in a new garage.

Harry F. Krueger, Milwaukee, succeeds Hares Motors, Inc., of Wisconsin, as distributor of the Locomobile and Mercer in Wisconsin. Krueger formerly represented the Locomobile and was general manager of Hares Motors while it handled this territory.

Houdaille-Wisconsin Co., Milwaukee, is a new \$5,000 corporation organized by C. H. Arneson, Charles A. Theken and J. L. Kustzger, to take over the distribution of the Houdaille shock absorber line in the Wisconsin territory.

Triangle Motors, Inc., Milwaukee, Stephens Six distributor in Wisconsin and northern Michigan, has been appointed distributor of the Haynes in the same territory.

M. O. Finks Garage, Shelbyville, Ill., was completely destroyed by fire on Feb. 2. The blaze was caused by an explosion in the paint shop. Fifteen automobiles were destroyed. Several employees were seriously injured in an effort to rescue cars and other property.

A. E. Rayment purchased a service garage at Freeport, Ill., and took possession Feb. 1. He will add a vulcanizing plant and specialize in tire and other repairs.

O. R. Twiford, late of Arcola, Ill., operating the Arcola Motor Co., which distributed Ford cars, has retired from that company and purchased the garages at Arthur, Ill., and Atwood, Ill., both of which handle the Ford car. He will conduct both agencies.

Elmer and Ray Mizer have purchased the J. D. Livingston garage at East Moline, Ill., and Livingston retires. The new owners plan various improvements and enlargements and will add a line of tires and accessories.

F. E. Staats has filed a suit to dissolve his partnership with Walter Utt at Virden, Ill. The two men have been conducting a garage. Staats asks for an accounting and adjustment of their respective interests.

William Hamachek, Two Rivers, Wis., Buick dealer in Two Rivers and Manitowoc, Wis., for twelve years, has been given the additional territory of Sheboygan county and has opened a third sales and service station in Sheboygan.

Brandt Auto Co., Appleton, Wis., Ford dealer, has opened its new \$50,000 sales and service building.

Krause-Dietz Motor Co., Milwaukee, is a new concern appointed Oldsmobile dealer in Milwaukee county. It has opened a sales and service house. Emil A. Krause and Clarence H. Dietz are the principals.

Jacob Saris, Beloit, Wis., Ford dealer, contemplates the erection of a two-story brick and concrete headquarters building, to cost about \$45,000.

Madison-Buick Co., Madison, Wis., Buick dealer, has opened a retail automotive equipment department, featuring Stewart-Warner products, Goodyear tires, Alemite and Bassick products, in charge of P. H. Baldwin.

Hyland Garage Co., Portage, Wis., is a new \$15,000 corporation organized by J. B. Jackman, Henry Reichling and Cyril Routier, all of Portage.

Owen Kelly, Blanchardville, Wis., has relinquished the Ford franchise to become Studebaker dealer.

Hans Fast Garage, Watertown, Wis., has been appointed Chalmers and Maxwell dealer.

Harold J. Mamernik, Fond du Lac, Wis., Elgin Six dealer, has incorporated his business as the Mamernik Motor Co., with \$15,000 capital, and on Feb. 1 moved to new and larger quarters in the former Nash Sales Co. garage.

Acme Auto Supply Co., Rock Island, has been organized to handle automobile accessories and storage batteries. B. H. Kemper, Walter Beckwith and Fred Camy are proprietors.

John O'Connell, El Paso, Ill., dealer in tires and other motor vehicle accessories, has been served with a notice of involuntary bankruptcy by the Maxwell-Chalmers Sales Co., the Pennsylvania Rubber Co., and the Automobile Supply Co. of Chicago. Claims aggregating \$6,000 are alleged. The petitioners claim that O'Connell is showing preference to some of his creditors and that upon one occasion, paid the Peoria, Ill., Motor Sales Co., \$700.

Alkire-Smith Ford Agency, Salt Lake City, was declared to be going to take up the agency for the Chevrolet. The report was denied.

R. P. Everence of Champaign, Ill., and F. C. Stearns of Rockwell City, Ia., have opened a garage in the former city. They will specialize in the repair of motor vehicles. Stearns conducted a repair shop in Rockwell City for ten years, while Everence operated a similar business for many years in Champaign, retiring in 1917.

John S. McDonald, Raleigh, N. C., for a number of years connected with the automotive distributing field here, has opened a fuel accessory and Goodyear service station.

Milwaukee Oldsmobile Sales Co., Milwaukee, a retail Oldsmobile dealer in Milwaukee county, is building a new sales and service building, to be ready March 1. The present quarters will be taken over by the Chidester-Frint Co., distributor of the Durant in Wisconsin and Upper Michigan.

Automotive Electric Service Co., Madison, Wis., has been reorganized following the retirement of Robert J. Nickles, who founded the concern in 1918, as a small battery service shop. Louis W. Shakshesky becomes president; L. C. Gunderson, vice president; W. Merrill Shakshesky, secretary-treasurer and general manager.

Augusta, Wis. Service Co. has been incorporated for \$15,000 to deal in motor vehicles, trucks, tractors, etc., and provide and furnish service, automotive equipment, etc. The principals are John C. Fear and Ben Johnson.

Klein & Walsh, Inc., Manitowoc, Wis., is a new \$10,000 corporation formed by J. L. Klein and R. M. Walsh to conduct a general automotive service business.

D. Matras & Sons, Inc., have filed articles of incorporation. The capital stock is \$20,000 and the business will be to deal in new and used motor vehicles and equipment. David Matras, 924 Walnut street, is president.

A. Z. Garage Co., Sheboygan, Wis., has increased its capital stock from \$10,000 to \$20,000.

Motor Car Sales & Supply Co., Milwaukee, is a new \$15,000 corporation organized by August, Elmer and Rubin A. Sommer, all of Milwaukee.

L. M. Nash, Wisconsin Rapids, Wis., hardware and motor car dealer, contemplates the erection of a new garage and repairshop costing about \$35,000.

Robert Marcus and Irving Tick have formed the Robert Marcus Co., to distribute battery, electrical, garage and service station equipment. The new company is located in New York City.

Franklin Motor Car Co. of Chicago led the list of Franklin dealers in 1921. Chicago jumped from third place in 1920 to first in 1921. The five Franklin dealers who took the largest number of cars during the past year were in their order: Chicago, New York, Boston, Los Angeles and Pittsburgh.

Luke Tire & Accessory Co. has been organized at Peoria, Ill., and has opened a plant with a vulcanizing department to be featured. J. W. Luke, the president, was formerly in the grain business in Peoria.

Cadillac Cars, Ltd., Montreal, Can., will deal direct with the Detroit factory in place of being a sub-agency of a Toronto firm. With reorganization of the present company it is entirely in the hands of a group of influential financiers in Montreal, the names of which will shortly be available.

E. W. Steinhart Co., Indianapolis, Ind., this week took over the business of the Oakland Motor Car branch, which has distributed Oakland motor cars in Indiana and will hereafter add Oakland state distribution. The headquarters of the Oakland business in the state will be conducted at the E. W. Steinhart building, and the former factory branch location lease will be sold with equipment, furniture and stock of Oakland demonstrators, which have been used by the branch.

Cooper-Springfield Co. has been organized at Springfield, Ill., for the purpose of distributing tires, tubes and batteries in the central Illinois territory. J. J. Maloney is manager of the company and the stockholders are largely residents of Springfield.

Heimlich Motor Car Co., of Milwaukee, has been chartered to deal in motor vehicles, equipment, conduct a garage and service business, etc. The incorporators are W. P. Heimlich, W. J. Heimlich and A. Engelmann.

Packard Motor Car Co. has appointed these agencies through its Springfield, Mass., branch: Girard Motors Co., Northampton, Mass.; Mansion House Garage, Greenfield, Mass.; S. W. Goodrich, Pittsfield, Mass.; Mosher Garage, Brattleboro, Vt.; H. G. Alexander & Son, South Londonderry, Vt.

Motor Tire Service Co., Concord, N. C., has recently been organized here.

General Motors Co., Charlotte, N. C., announces that in the future G. M. C. trucks will be sold and serviced in Charlotte and vicinity by a factory branch. The local branch will be under the direction of the newly-established factory branch in Atlanta, and will be open for sales and service in Charlotte and surrounding territory.

International Harvester Co. will open a retail sales store in Houston immediately. The company will specialize in parts and accessories for International trucks and will operate a repair station which will take care of any kind of trucks.

Gordon & Wilkenfeld of Houston are erecting a large and attractive building to care for their increased business. The concern carried a complete line of accessories, tires and supplies. A drive-in filling station will be installed at the new home, which will be ready for use about March 15.

Alkire-Smith Co., Salt Lake City, Utah's oldest Ford dealers, has declared its intention to relinquish the Ford agency here and take on the Chevrolet. The Alkire-Smith Co. will continue to supply Ford parts and maintain a Ford repair and service department. The new local Ford agents are the Goodwin-Dickson Auto Co.

Stewart & Williams Co. is the new Chicago distributor for the Anderson car. Frank W. Stewart is well known in local automobile circles and J. K. Williams, the other half of the firm, comes from the Board of Trade.

Frank C. Magrannis has opened his new automobile sales and service establishment in Northampton, Mass., where Hudson and Essex cars are attractively displayed.

Dayton Buick Co. has been chartered with a capital of \$25,000, to deal in the Buick line of cars and operate a service station. Incorporators are J. O. Miller, W. P. Baughman, F. R. Flory, Howard F. Heald and Frank L. Humphrey.

Douglas Lawrence Swan of Springfield, Mass., has been appointed manager of the Los Angeles branch of Rolls-Royce of America, Inc., and will assume charge immediately.

DELAWARE APPROVES LENSES

Wilmington, Feb. 10—A new law went into effect here Feb. 5 requiring automobiles to carry certain kinds of lenses, which must be approved by the motor section of the state department. So far the following have been approved:

Alfeco, Alvo, Bausch & Lomb, Benzer, Brown Deflector, Clamort-Conaphore, Clear Type B, Canphore noviel type B, Canaphore clear type F, Dillon Type E, Flexo, Ford green visor headlamp complete, Ford H green moon, Holophane no tile No. 855, Lee Knight, Lagalite, M-111, Liberty, Macbeth, McKee type D, McKee type L, McKee type M, National, Onlee headlight controller, Patterson, Saferlite, Shaler roadlight, Suess Rob model C, Two-way light die, Universal and Violet Ray.

COTTA RE-INCORPORATES

Chicago, Feb. 11—The old Cotta Transmission Co., of Rockford, Ill., which has been in the hands of a receiver for several months, has been re-incorporated by Rockford interests, with a capital stock of \$750,000, and has been renamed Cotta Transmission Corp. The business will be continued along old lines, but with new officials and directors not yet named.

GASOLINE TANK TAX

Buffalo, Feb. 10—Buffalo garage men have joined with refiners in opposing the curb station tax which the city council proposes to establish. Under the proposed tax a fee of \$50 would be taken for tanks of 500 gallons or under and \$100 for tanks containing more than 500 gallons.

The READERS' CLEARING HOUSE

Questions & Answers on Dealers' Problems

PRICE GUARANTEE INQUIRY

Q—I would like your opinion as to the exact meaning you would put on the following sentence: "Price guaranteed for one year from date, if price declines within that time, purchaser is to receive the benefit." This came up where the customer traded an old Dodge car in on a new one. During the year the price was reduced \$300, the old car of the same make also made a very sharp decline. Now the question is, just what, under the above agreement, is the "benefit?"

Had the customer waited until the decline in price to have traded his old car there would have been practically no difference between the amount he would have to pay now and the amount he paid at the time he traded.—F. C. Garst, Thomas, Okla.

We have not seen a court decision on this point and until such is rendered we can only say what would be the probable holding.

First, the guarantee as to price is made by the manufacturer and seller for the protection and benefit of a purchaser. The fact that the seller accepts, as part payment on the purchase price of a new car, a second hand car, whether of the same make as the car sold or not, would not affect the liability of the seller under the guarantee. So, unless there was a further agreement between the seller and the customer as to an adjustment of the reduced value of the second hand car, there ordinarily would be no right for the seller to claim a reduction as an offset to the guarantee.

The second-hand car has its value determined by you at time of sale. You have the right to convert it into cash immediately, without holding it for a reduction. The seller of the second-hand car retains no control over the car or its price after he has sold it, as the seller does of the new car under his guarantee.

Therefore, we are of the opinion that the benefit to a purchaser under the guarantee would be the full amount of the decline in price—or \$300, in the case you present.

NEW STORAGE LAW

Q—Does this new law which compels garagemen to have a license and file bonds apply to storage on side stalls which rent by month? If so, will anyone who rents out a barn or shed for storage come in on this law?—A Reader.

The Act referred to reads " * * * no person, firm or corporation shall engage in the business of storing personal property for hire without a license issued by the public utilities commission. * * * "

Your questions are answered by determining what is engaging in business of storing for hire. The law is new and there are no decisions on the point as yet. The language of this act appears broad enough to include all hiring.

The Readers' Clearing House

This department is conducted to assist dealers and service station executives in the solution of their problems.

In addressing this department, readers are requested to give the firm name and address. Also state whether a permanent file of *MOTOR AGE* is kept, for many times inquiries of an identical nature have been made and these are answered by reference to previous issues.

Inquiries not of general interest will be answered by personal letter only. Emergency questions will be replied to by letter or telegram.

Addresses of business firms will not be published in this department but will be supplied by letter.

Technical questions answered by B. M. Ikert and P. L. Dumas; Legal, by Wellington Gustin; Paint, by G. King Franklin; Architectural, by Tom Wilder; General Business questions, by *MOTOR AGE* organization in conference.

However, if it is a renting of a barn or building as a landlord and not as one in the business of storing personal property for hire, the law would not apply.

NO CHAUFFEUR'S LICENSE FOR MECHANIC

Q—Does a mechanic or helper testing cars in a garage, after working on them, have to have a chauffeur's license?—M. B. Simonson, Galesburg, Ill.

A mechanic or helper testing cars as stated in your inquiry is not required to have a chauffeur's license, in our opinion. The law applies to those who drive cars for hire, and we do not think such work could be called driving a car for hire.

COURSE OF STUDY FOR THE SERVICE MANAGER

Q—In your issue of Dec. 8 there is an article by B. M. Ikert entitled, "The Service Manager as a Semi-Engineer," which is very good. Would you please give me the names and publishers of books or magazines that you think one should have to equip himself and keep posted as to the changes in car design and in the industry?—F. M. DeBovoise, General Motors Corp., Detroit.

It is difficult to advise anyone as to what books they should read or how they should continue their education. The principal difficulty in this regard is that we do not know much about your education or what you have read.

We know of no magazine that will

give you more definite information on changes in motor vehicles or mechanical problems that occur from day to day than *MOTOR AGE*. In fact, we know of no other magazine that publishes changes in this regard.

As to books, we are sending to you a catalogue of the U. P. C. Book Co., 239 W. 39th St., New York City, and if you do not find in this catalog the books that appeal to you, we suggest that you communicate with the manager of this company, who gives a great deal of attention to automotive books and is very familiar with them.

DORT PISTON PINS

Q—We have a new set of pistons and pins for a Dort car. The pins fit loose enough so that I can push them in with my fingers. They don't seem to have any play. Do you think it would be advisable to go ahead and install them, or would you advise buying a larger size pin?—R. A. Myers, Murray, Ky.

If these pins have not more than .001 inch clearance they can be safely used. Or discarding dimensions, if the pins fit into the wrist pin bushings without any noticeable play up and down they can be safely used.

BACKLASH DETRIMENTAL TO AXLE

Q—We are experiencing trouble with driveshaft on Chalmers model M-11, No. 27,201. This shaft will turn from one-quarter to one-half a revolution before slack is taken up. It causes lots of strain on the spiders of the full floating axle which often break. Can this be remedied by adjustments and if so, how?—J. C. McGuire, Loomis, Neb.

This back lash is caused either by play in the universal joints, improper adjustment of the rear axle gears or back lash in the transmission or splined axle shafts at the hub. The only adjustment provided is in the rear axle gears. The pinion may be moved in or out and the ring gear may be moved laterally to remove any back lash that may exist between the pinion and ring gear. There should not be more than .010 back lash between these gears.

If you are certain that pinion and ring gear are adjusted properly, you should look to the universal joints. The back lash caused by wear in these joints cannot be compensated for except by replacing the worn parts. This holds true of the axle shaft spiders, which should be very tight on the axle shaft end. The high speed shaft in the transmission should also be examined for back lash. As in the case of the universal joints, the only cure for this is to replace the worn parts.

INSTALLING AMMETER ON CHANDLER

Q—Publish wiring diagram showing how to connect ammeter to Chandler Six, model 17-1916.

2—We have a Chalmers Six-30, 1917 model. Advise how to regulate output of generator.—S. L. Seeley, Plymouth, Ia.

1—Diagram showing installation of ammeter on this car is shown in Fig. 1.

2—The charging rate of this car is controlled by the position of the third brush. The holder containing this brush is secured by an insulated ring mounted in the rear bracket by a single hexagon nut. After loosening this nut the holder can be moved either with rotation of the armature to increase the output or against rotation of the armature to decrease the output until the desired setting is obtained.

A slight movement produces a marked effect and it is important that the face of the brush is making good contact with the commutator. A loud sing indicates poor contact. The location of the third brush can be easily seen when the commutator cover plate is removed. It is mounted on the insulated ring and is held in position by a nut and lock washer.

CONGEALED OIL CAUSES HARD CRANKING

Q—What is the cause and remedy of a Ford getting so stiff when cold that it cannot be cranked until a wheel is jacked up?

2—Show the adjustments on the Stromberg carburetor used on Ford cars.

3—Would you advise regrounding a 1914 Ford block that runs well and has good power but has to have carbon cleaned out about every 500 miles? It does not foul the plugs.

4—What causes a carbon knock or what makes the noise?

Your answer to N. D. Robinson, of Columbus, Miss., in *MOTOR AGE* dated Aug. 12, does not seem correct. You say the only permanent way to remove end play from Ford crankshaft is to install new center and rear bearing caps. It does not seem to me that the center cap has anything to do with taking up end play. This is left to the rear cap. If the crankshaft becomes worn on the flange that bolts to the flywheel (which is usually the case), a new rear cap will not remove the end play and the only real way is to put in new crankshaft.—Pellville Garage, Pellville, Ky.

1—This is caused from the oil congealing in the multiple-disc clutch, causing the clutch to drag and with the consequent tendency for the car to move forward when the crank is turned. By jacking up the rear wheel and placing clutch control lever forward the clutch is cut out and the person cranking the car will turn the entire rear axle mechanism and the clutch as one unit.

2—Illustration of the Stromberg carburetor for Ford is shown in Fig. 2. Adjustments are secured as follows: If you wish an entirely new adjustment, place throttle lever in the wide open position, and holding it firmly in this position screw high speed adjusting nut "X" to the right or clockwise until it becomes tightened. This means that the needle which it controls is on its seat. Then with the throttle lever in the same

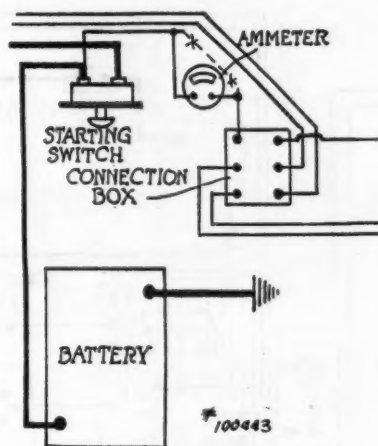


Fig. 1—Installation of ammeter on Chandler model of 1916

position turn nut "X" back or anti-clockwise twelve notches or one quarter turn. This will give you a temporary adjustment for the high speed range.

Next, the low speed adjustment "Y" must be screwed in as far as it will go, then opened up one-half turn. The adjustment you will then have will be approximately correct, and the engine is ready for starting. To start the engine open throttle control about three-quarters of an inch on the quadrant, advance spark lever to usual position for starting, and pull up lever on steering column control as far as it will go. Then, holding out primer "C" with left hand, crank the engine.

Do not attempt to make any further adjustment on the carburetor until the engine is thoroughly warmed up to its normal temperature. The final adjustment may then be effected in the following manner:

First, gradually close the throttle with a medium retarded spark until engine slows down to a low idling speed. At this time the control stop "Z" should be touching stop screw "W." This screw can be regulated to obtain the desired low engine speed by screwing it out if the engine is running too fast, and in if there is tendency for the engine to stop. It does not, however, control the mixture adjustment in any way. If the engine does not hit evenly under this adjustment for low speed or idling, turn low

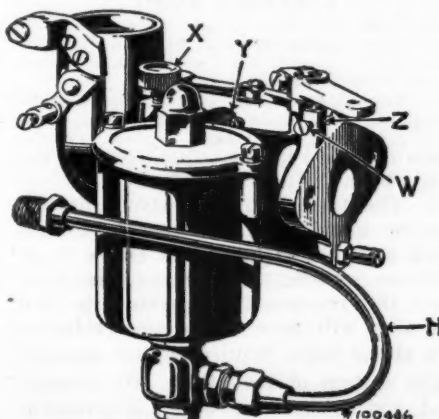


Fig. 2—Stromberg Ford carburetor showing points of adjustment

speed adjustment nut "Y" in or out until the desired results are obtained.

The low speed and high speed adjustments are independent of one another, and neither one affects the other in any way. To obtain the final high speed adjustment open throttle lever on quadrant about one inch and advance the spark to regular running position. Then, if the engine is hitting unevenly, turn high speed screw "X" right or left one notch at a time, until it is hitting evenly. In order to effect the most economical adjustment, the needle controlled by screw "X" should be opened until engine begins to slow down or run irregularly, then turn back two or three notches.

3—If high grade oil is being used in this car and it persists in carboning up the most economical procedure is to reground the block. However, unless the highest grade of oil has been used this carbon may be due to a low quality lubricating oil.

4—A carbon knock is caused by particles of the carbon deposit on cylinders, and piston becoming incandescent from the heat. This condition which usually happens when an engine full of carbon is placed under a hard laboring pull which causes the gas that is being compressed to be ignited by the glowing or incandescent particles of carbon before the piston has reached the top dead center position on the stroke. In other words, this causes preignition, the tendency being to start the piston down in the opposite direction with a consequent knock.

Regarding the removing of end play in a Ford engine, we entirely agree with you that the center main bearing cap has nothing to do with the removal of end play. This was a typographical error. It should have read that in some engines the center main bearing was used to take up the end play, whereas in others the rear main bearing was used. However, we cannot quite see why a crankshaft built of alloy steel should show any wear under normal conditions of driving over a period of years, compared with the wear that would ensue on a soft babbit bearing. The proper procedure where the flange on a Ford crankshaft has worn is to turn the crankshaft at the flange until a uniform face is secured and then put in a new bearing cap of sufficient length to take up this.

FEATURES OF 1922 MAXWELL

Q—Can you tell me what kind of pistons the 1922 Maxwell use? Are these pistons lynite or cast iron, also where can I procure a set of these pistons?

2—Did Maxwell change the gear ratio in the 1922 car?—W. B. McClellan, Auburn, Ia.

1—The 1922 Maxwell uses the constant clearance type of aluminum piston. A set of these pistons can be secured from any authorized Maxwell dealer or direct from the Maxwell factory.

2—Yes. The gear ratio this year is 4-5/9 to 1. Previously the gear ratio was 3.58.

INFORMATION ON NORTH EAST SYSTEM

Q—Where can I secure valves for Dodge car with 1/64 in. oversize stems?

2—What makes the Dodge grind or growl in the transmission when you try to reverse?

3—Is a good grade of valve grinding compound alright to lap in pistons?

4—Can you suggest a plan for test bench to test the North East system?

5—Where can a good text book for the North East system be purchased? Also a good automobile repair book?—The Outlaw Repairman, Burton, Neb.

1—We are informed by the local Dodge Service Station that these valves can be secured from the U. S. Manufacturers Sales Corp., 2204 S. Michigan Ave., Chicago, Ill.

2—This is due to worn bearings or wear in the reverse gear.

3—Valve grinding compound can be used for lapping in pistons, but it should be thoroughly washed out afterwards with gasoline because it has a habit of impregnating itself in the pores of the metal and is very detrimental. There are several good compounds on the market designed especially for cylinder lapping which, fortunately, possesses the advantage that they break down very soon after they are placed between the surfaces to be lapped, and, if any of the compound is left after the job is done, it will do no harm.

4—An illustration is shown in Fig. 5 relative to test bench designed especially for North East equipment.

5—The U. P. C. Book Company can supply your wants regarding a book on automobile repairing. Text books on the North East system are supplied by the North East Electric Co., and we would advise that you communicate with them. Their address is Rochester, N. Y. They publish the North East Book of Service Information and the North East Service Station Manual, both of which are very thorough in their handling of the subject of servicing of the North East equipment.

POOR CARBURETION FROM SPECIAL VALVES

Q—I have a Ford touring car into which I put Fordson special valves. Reamed the seat so that it measures one and one-half inches in diameter. The valves seat good, but I have no power. Have a regular Ford Holley carburetor and the same manifolds. I did not ream the manifold ports. Would reaming the manifold ports help?

2—How much can they be reamed out without going through the water jacket?

3—Where can I get a reamer for this job?

4—What will it cost?

5—What size carburetor is best and what make?

Can the old manifolds be used if the ports are reamed?

6—Where can manifolds be secured and what is their cost?—J. E. Lyon Auto Co., Centalla, Mo.

1—This is due to the inability of the carburetor to take care of the enlarged valves. Reaming the ports and installing larger manifold and carburetor would increase the power.

2—To approximately one and five-sixteenths inches, although the blocks vary



Fig. 5—Test bench recommended by the North East Electric Co.

and care should be exercised in the enlarging operation.

3—This job is best done at a machine shop with the cylinder mounted on the drill press base plate. Start with a drill slightly larger than the present port size and gradually increase the diameter in easy stages using a slightly larger drill each time until the ports are to the desired size. By carefully noting the sound of the drill as it goes through the metal the dangerous point can be determined before damage is done. If the drill goes through the water jacket and the hole is welded there is a very good chance of distorting the cylinder bores which should be reground if this happens.

4—Refer to above answer.

5—A one and one-quarter inch carburetor is best. As to the make any of the standard carburetors will give good results. *MOTOR AGE* does not give opinions on the relative merits of the various carburetors.

6—This information will be supplied by letter.

CADILLAC CHAIN ADJUSTMENT

Q—Describe and illustrate the chain adjustment on the new Cadillac.

2—Supply the address of the firm making a satisfactory external foot brake for Fords. I am referring to a brake on the rear wheels.

3—Supply the address of a firm making a satisfactory hot-spot that could be installed on cars such as the 1912 and 1913 Cadillac.—Roy Howard, Vancouver, B. C.

1—The chain adjustment is shown in Fig. 6. To adjust proceed as follows: Camshaft sprockets N and L are not integral nor do they bear upon the camshaft as in earlier eight-cylinder construction. The camshaft sprockets have their bearings and rotate upon eccentric surfaces H and F of the support C which is clamped into the crankcase by the locking collar A. The camshaft J rotates in bearings carried in the support C.

Shafts E and B fitted with worm gear I and G meshing with teeth cut upon the flange D of the support C and with teeth cut upon the collar serve as means

whereby the collar A may be loosened or tightened and the support C turned. Turning the support C by the shaft E, which may be done after the collar A is loosened by turning the shaft B in a clockwise direction, raises the sprocket N and lowers the sprocket L, as these sprockets have their bearings upon eccentric surfaces of the support C.

In other words, the center distances are increased between the crankshaft sprocket T and the camshaft sprocket N and between the fan sprocket S and the camshaft sprocket L. The chains are thus tightened. Camshaft sprocket N is driven from the camshaft sprocket T by the chain K. Camshaft sprocket L is driven from camshaft sprocket N by a universal cross N through lugs on the inner surfaces of these sprockets.

Camshaft J is driven by camshaft sprocket N through the universal cross O and the driver P. The fanshaft sprocket S is driven from the camshaft sprocket L by the chain R. To make the adjustment, turn the shaft B six complete revolutions in clockwise direction. This will loosen the locking collar A screwed into the inner end of the support C. Turn the shaft E in clockwise direction sufficiently to reduce the movement at the periphery of the fan to 3/8 in., without slipping the clutch at the fan hub; then turn the shaft B in the counter-clockwise direction, thereby clamping the support F into place.

When chains become so badly worn that readjustment cannot be made, remove the offset link of each chain, and then loosen the locking collar by turning the shaft B six complete revolutions. Turn the shaft E in the clockwise direction, bringing the sprockets L and W into positions such that the chains can be replaced in pairs. Do not replace one chain only.

2 and 3—Will be answered by letter.

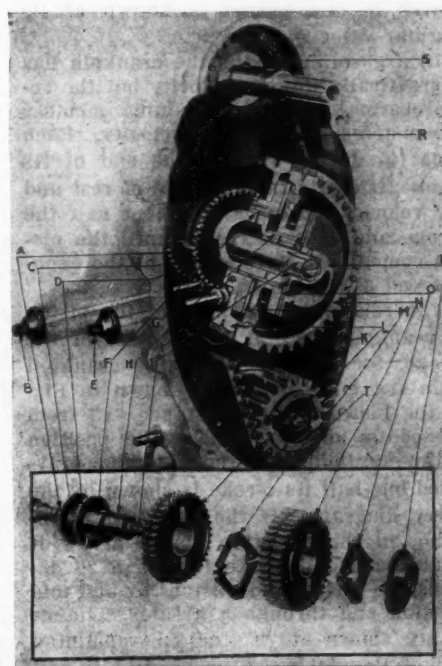
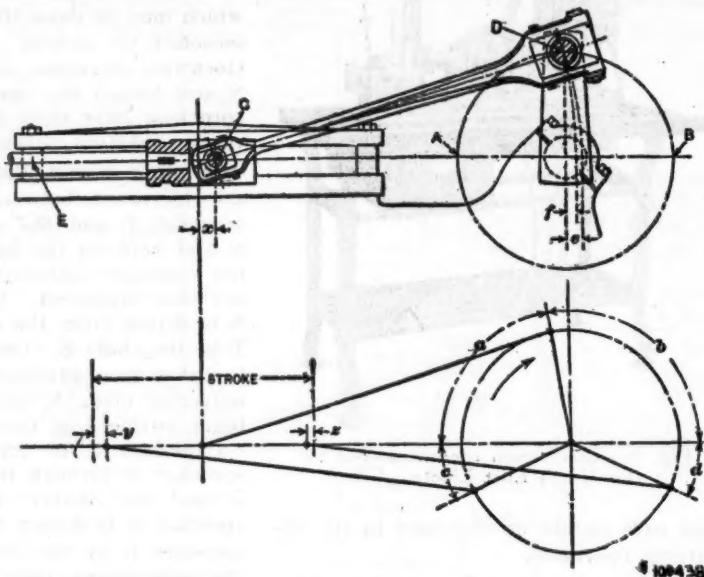


Fig. 6—Exploded view of Cadillac chain drive layout

Relative Motions of Crankpin and Piston

Fig. 8—Variation in piston travel at different points of crankshaft rotation, shown graphically



Q—We have had an argument as to whether the travel of a piston is ter on the top half of the stroke or on the lower half of the stroke. If there is a difference will you explain the reason why?—Herrin Battery Sta., Herrin, Ill.

The travel is not the same. Before an explanation is advanced it will probably be well to give a definition for velocity. It is the rate at which a moving part changes its position, and numerically it represents the units of distance traversed in a unit of time, so that the rate of motion or the distance traversed divided by the time required may be expressed in feet per second or minute or miles per hour, etc. When the distance traversed by a point along its path in a given time is measured or expressed in linear measure, the rate of motion is called linear velocity. The angle through which any radius of a moving body moves in one second is known as its angular velocity.

In a gasoline engine the crankpin has a practically uniform velocity but the reciprocating member or sliding member the piston has a variable velocity. Each time the piston reaches the end of its stroke, it starts from a state of rest and the velocity increases for about half the stroke and then decreases until the piston comes to a state of rest at the opposite end of the stroke.

The relation of position of the piston to crankpin vary at every point of the stroke, for instance when the crankpin is in the mid-position as shown in Fig. 8 the piston is at a distance "x" from the center of its stroke. The position of the crankpin when the piston has traversed one-half its stroke is shown by the lower diagram. If the crankpin is rotating in the direction of the arrow it would turn a distance less than 90 degrees, to bring the piston to its mid position and through a greater distance of arc shown at "b" for the remaining half of the stroke of the piston. It will thus be seen that the relative motion between the piston and the crankpin dur-

ing the first half of the stroke is different from that of the second half. This variation of movement can be proved by observation on any engine using the conventional reciprocating motion.

It can be illustrated by locating the distances that the piston moves for equal movements of the crankpin; for example, if the crankpin is moved through an arc "c," from the dead center position, the crankpin will move a distance "y," but if the crank is placed on the opposite dead center position and then moved through an arc "d" which is equal to "c" the piston will move a distance "z" which is less than "y." The variation in this distance is varied by the length of the connecting rod. The longer the connecting rod the less will be the variation in this distance. This is due to the fact that one-half of the crankpin circle curves toward the piston and one-half away from it. This variation in velocity is overcome on some types of steam engines and steam pumps by means of a slotted cross head or Scotch yoke on the crankpin.

ELECTROPLATING

Q—Give information on how to silver-plate on nickel or nickel-plate on tin and brass, mentioning what solution is used, also what voltage is required—Edward Kionka, c/o Talcott Battery Co., Albert Lea, Minn.

For details not mentioned for electroplating we would refer the reader to special hand books for electroplating like Watts & Philips Electroplating and Electrorefining of Metals or the smaller books of Van Horn and others. The following is only a brief account. The nickel salt generally used for nickel plating is nickel ammonium sulphate.

For small baths the salt is dissolved by boiling 12 to 14 ounces of the salt per gallon of water in a new stone jar and filling up the bath with water until a hydrometer placed in it stands at 6.5 degs. to 7 degs. beaume. The solution should be slightly acid, but too much

acid will cause peeling and too much alkali will darken the tone of the work. The recommended current density for plating zinc with nickel is .05 to .10 amperes per square inch of the surface of the object to be plated.

For plating nickel on other metals use half this current density. To improve the quality of the nickel deposit, certain additions to the bath have been recommended, one is the addition of .125 ounces of benzoic acid per gallon of solution. A standard solution for silver plating is the double cyanide of silver and potassium with silver anodes. A good silver plating solution is obtained by dissolving 25 g. pure silver cyanide in a solution of 25 g. potassium cyanide in 300 to 500 cubic centimeter water and diluting the solution so as to form one liter.

The best current density is .001 to .0045 amperes per square centimeter with about one volt at the terminals of the cell. Another prescription for experimental work is to dissolve three ounces of silver chloride (rub to a thin paste with water) in a solution of 9 to 12 ounces of 98 per cent potassium cyanide in a gallon of water, a current density of 1/60 ampere per sq. in. is recommended in the latter case.

SPRUNG DIFFERENTIAL CASE WILL CAUSE NOISE

Q—We have a customer who is having considerable trouble with his rear axle. At least it sounds just like the rear axle trouble. We removed the rear axle and examined everything carefully and found nothing that we could think would give trouble. Could it be possible that the differential gear is out of line?—George Stancombe, Oakland Ave. Garage, Pontiac, Mich.

The information given in your question is very indefinite. Before a satisfactory diagnosis can be given it will be necessary to know the make of axle and car to which axle is attached. It is possible for the differential gear to be out of line. This can be detected by placing the differential carrier assembly between centers on a lathe and noting whether it runs true or not. A maximum of .008 is allowed for variations from the true on this part. Variation of running in excess of .008 will cause a decided noise or growl in the rear axle.

NON-CIRCULAR CYLINDERS CAUSE OIL PUMPING

Q—The engine in a Ford car has always pumped oil on number one cylinder. New leak proof three-piece rings were installed last spring with no results. Pistons were drilled with oil holes without any benefit being derived. Engine has very sloppy valve stems, almost large enough for 1/64-in. oversize. Will oversize valves stop or improve this condition? If not, what will?—Thebes Garage, Thebes, Ill.

This trouble is due to number one cylinder being out of round. The positive cure for this trouble is to have the cylinder reground or rebored and a new piston and rings fitted. If the cylinder is of uniform diameter there will be no necessity for the use of leak proof rings.

CHANGING MAXWELL REGULATOR AND CUTOUT

Q—Explain how to change a 1918 model Maxwell so as to eliminate the combination regulator and cutout, and in its place put an ammeter, and on the dash install a cutout.—H. O. Pope, Floydada, Texas.

Fig. 9 shows the changes necessary to get the desired results with the regulator eliminated. An ammeter, not a volt meter, is the proper instrument to use, and one wire that is connected to it is the one that formerly went from the starter switch to the battery terminal on the ignition and lighting switch. The short wire that formerly went from the "Bat" terminal of the switch to the regulator will now go to the other ammeter terminal as shown.

From the motor generator, two small wires formerly went to the "Field" and "Dyn" terminals in the fuse box. These wires should be removed and in their place a coil of iron wire should be connected across the generator terminals as shown, to complete the field circuit. It will be necessary to experiment with this coil of iron wire until the generator output is alright, 7 or 8 amperes being usually enough with a 12-volt system. As a suggestion it might be well to try stove pipe wire wound on a piece of asbestos, the more wire used, the lower will be the charging current to the battery. The output can be any standard 12-volt cutout, these usually having a "G" terminal which goes to the generator and a "B" terminal which goes to the ammeter.

If there is no other terminal, it is always necessary to ground the base of the cutout, by running a wire from it to some part of the engine or to the frame of the car.

STARTER GENERATOR ON 1919 DODGE

Q—We have a North East starter generator on a 1919 Dodge that will only charge four amperes. This is a single wire system, third brush being set up as far as it will go. It has been cleaned and new brushes fitted, with no results. It works well as a starter and the commutator appears to be in good condition. What can we do to get more current out of the generator? — Wilson Brothers Garage, Maxwell, Neb.

In regard to the North East motor generator on which you are having trouble due to low output, would suggest that you look at the brushes that you installed and make sure that the two yellow brushes were used on the main brush holder and that the black brush was used on the third brush holder, which is at the lower part of the commutator. On this motor-generator, two-third brush arms have been used, one shorter than the other, the short brush holder locating the third brush in such a position as to give greater output, and if you can get in touch with an authorized North East station, would suggest that you get one of these short third brush arms and install it in place of the other.

If the short third brush arm is not available, you can file another tooth in the sector so that the brush may be

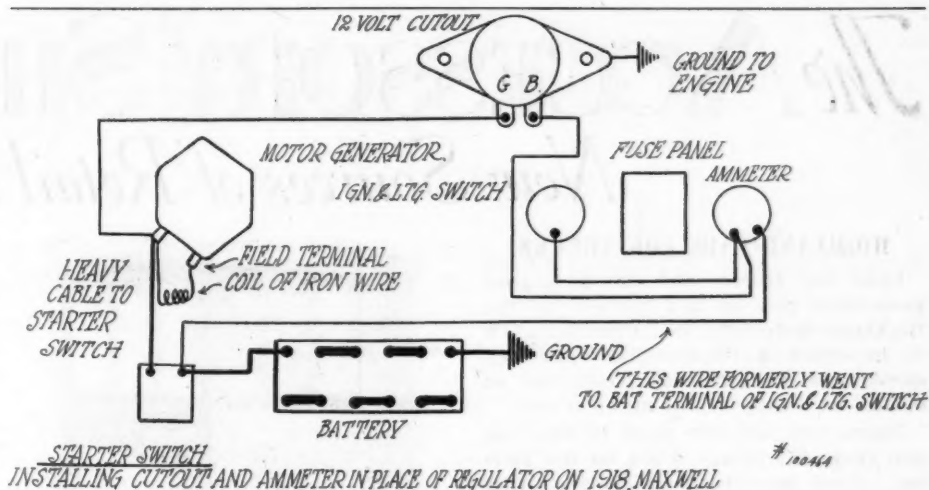


Fig. 9

shifted farther in a counter-clockwise direction, while, if the short arm is available, it is well to cut a tooth on the other side, as the change in brush holder arms sometimes gives too high an output. We believe that this information will enable you to overcome the trouble and get an output of 7 or 8 amperes, which is considered normal for a 12-volt system. If you still have the Dec. 1 issue of MOTOR AGE, you will find in it a full description of the North East electrical system on the Dodge car.

CONVERTING HUPMOBILE INTO RACEABOUT

Q—We are rebuilding a Hupmobile 20, using a Ford rear axle assembly. What is the gear ratio? We are using 28 by 3 wire wheels.

2—What speed should be attained? The car complete weighs but 850 pounds.

3—Would it be advisable to make the flywheel lighter?

4—Where is the engine number located?

5—What is the bore and stroke and h.p. of Hupmobile engine?

6—Publish wiring diagram of the new Maxwell 25, using a 6-volt battery.—Harry W. Trabbold, Philadelphia, Pa.

1—28 by 3 in. wire wheels give a gear ratio slightly higher than the Ford gear ratio. The regular Ford rear axle reduction is 3-7-11 to 1.

2—With 28 by 3 wire wheels and a stock engine it should be possible to obtain 40 to 50 m.p.h.

3—No.

4—The engine number is located on the plate on the dashboard near the steering column. However, no separate engine numbers stamped on the engine during the time when the Hupmobile 20 was produced. There are certain parts marks however that can be deciphered by the Hupmobile Company and these parts numbers should be used when ordering parts.

5—The bore is $3\frac{1}{4}$ and the stroke $3\frac{3}{4}$ with a h.p. of approximately 21 at 1900 revolutions.

6—The diagram of the Maxwell 6-volt Auto-lite system is shown in Fig. 10.

RACING BODY FOR NATIONAL

Q—Advise where we can secure a racing type body to fit a 1913 series BN-7 National car.—The Deadwood Motor Company, Deadwood, S. D.

We know of no firm engaged in the manufacture of a racing body to fit this particular chassis. This body could be constructed by any of the leading custom body makers, a list of which will be supplied you by special letter.

READER WANTS PATTERNS FOR SPEEDSTER BODY

Q—Advise where I may secure patterns for constructing a Ford speedster.—J. F. O'Neill, 758 E. Third St., South Boston, Mass.

This information will be supplied by special letter.

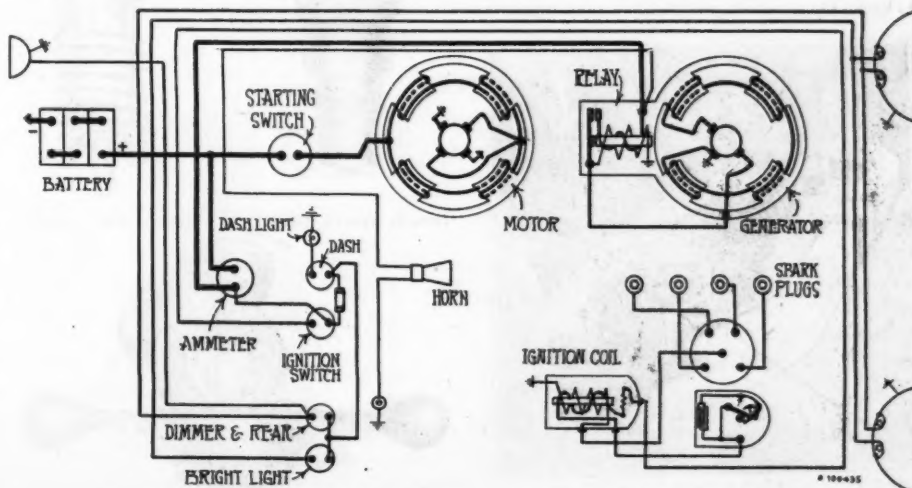


Fig. 10—Diagram of wiring of new series Maxwell using 6-volt system

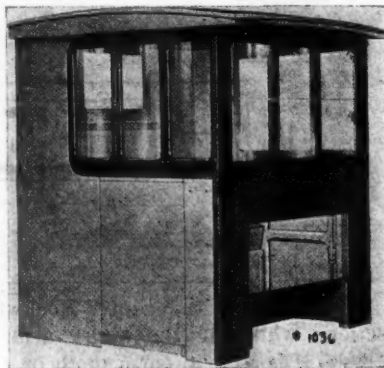
The ACCESSORY SHOW CASE

New Sources of Retail Profit

HIGHLAND CABS FOR TRUCKS

Cabs for trucks and speed wagons have been put on the market by the Highland Body Mfg. Co., Cincinnati. It is in effect a combination open and closed cab—a closed cab which can be opened as completely as an open cab.

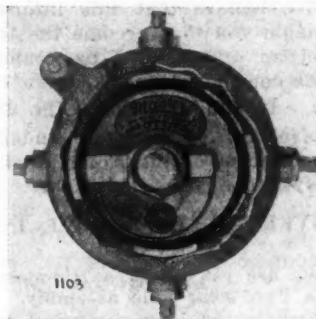
There are just two sizes of this cab and they will fit any truck on the market. They have been so designed that they can be fitted to chassis of any make. One size, 54 in. wide, is a light cab for speedwagons or one-ton trucks. The other size, 60 in. wide, is for all trucks of greater capacity.



Highland cabs for trucks

RIDE EASY SPRING BOOT AND OILER

The Ride Easy spring boot and oiler is laced securely about the springs completely enclosing and protecting all surfaces that are exposed by expansion, as illustrated. An opening for oiling is made and it is claimed that a car equipped with this device will wear longer and ride easier. U. S. Auto Appliance Co., Salt Lake City, Utah.



Master rotor for Ford timers

RATHBURN RESILIENT BUMPER

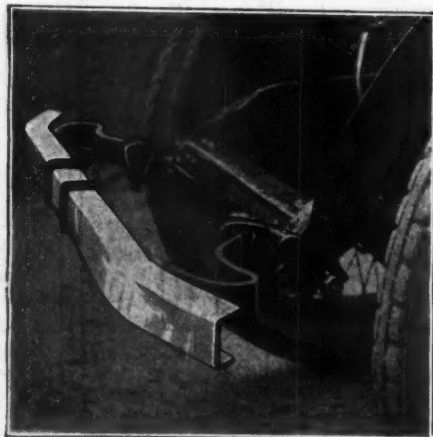
This bumper is designed to give added strength and ornamentation to the car. A steel channel bar is fitted to the spring sections, giving more strength at this point. The bumper is furnished in a variety of colors, including red, gray, tan and green. Rathburn Mfg. Co., Muncie, Ind.



Ride Easy spring boot and oiler

TASCO GASOLINE GAGE FOR FORDS

With this gage, the driver can tell in an instant the amount of gasoline the tank contains. With it, the measuring stick is unnecessary because the gage registers on the tank cap the number of gallons therein. It is installed in place of the cap. Price, \$1. Arkon Selle Co., Arkon, O.



Rathburn resilient bumper



Bosch spark plug



Allen valve inside



Defiance radiator cap

BOSCH SPARK PLUG

American Bosch Magneto Co. has recently placed on the market a number of new spark plugs, the sizes and specifications of which are: $\frac{3}{8}$ -in. standard with large hex, $\frac{7}{8}$ -in. standard with S. A. E. hex, $\frac{7}{8}$ -in. long with large hex, $\frac{7}{8}$ -in. extra long with large hex, $\frac{7}{8}$ -in. long with S. A. E. hex, $\frac{1}{2}$ -in. with pipe thread, and 18 millimeter metric.

Price, \$1. American Bosch Magneto Corp., Springfield, Mass.

DEFIANCE RADIATOR CAP

Defiance Radiator Cap is the product of the Universal Products Co., San Francisco, Cal., and is applied the same as any other radiator cap excepting that it acts as a lock for the motor meter when it is applied. The feature of this accessory is that when the meter is attached it is not necessary to drill any holes or make any repairs of any kind. For Ford cars, \$3.50. Other cars, \$4.50.

MASTER ROTOR FOR FORD TIMERS

The Master Rotor is an attachment for the timer, which, when used, is said to give longer life to that vital part of the Ford motor. The cut illustrates the operation of the rotor and claims by the manufacturer are a better working of the motor with installation of the rotor. Price, \$1. White Brass Castings Co., 1649 W. Grand Ave., Chicago.

BENZER WIND DEFLECTORS

Benzer Corp., Brooklyn, N. Y., presents a number of accessories in the way of wind deflectors, mirrors, etc., among them being the windshield wing pictured here. The feature of this product is the mirror which reflects cars in the rear. Price, \$7.

ALLEN VALVE INSIDES

Allen Valve Mfg. Co. has brought out a new valve inside which is pictured here, designed to be of more leak-proof power and longer life. Allen Valve Mfg. Co., Los Angeles.



Benzer wind deflectors

SERVICE EQUIPMENT

Aids for Time Saving & Accuracy

PERFECT-LITE POWER PLANT

Perfect-Lite Power Plant is especially adapted to farm use though need for it may be found in the service shop. It burns gasoline or kerosene and is intended to supply light and heat. Its parts, that is the piston, piston rings, connecting rod, valves and tappets can all be replaced with Ford made parts. With each outfit there is a battery carrying a five year guarantee. Price, complete, including battery, \$545. Perfection Hoist & Engine Co., Two Rivers, Wis.

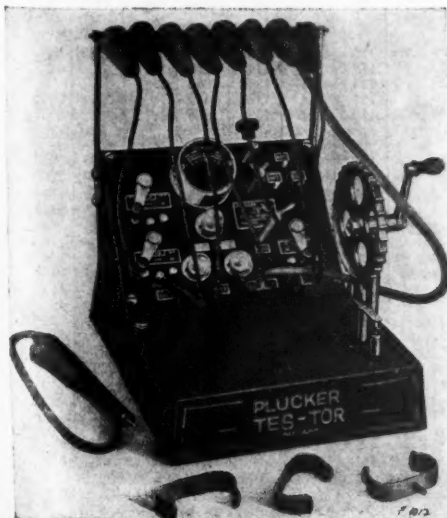
PLUCKER TES-TOR

The Plucker Tes-Tor is an instrument designed to locate any and all troubles in the electrical system of any car. It is compact and simply constructed of good materials. The base of iron is black enameled, the other metal parts are of brass heavily nickel-plated. The test clips, test points, wire and interrupter are strongly constructed and made so as to obtain speeds from low to high, allowing tests to be made under same conditions as if part were on car.

Completely housed under the base are the various test parts such as coils, condensers, resistance, etc. Plucker Electrical Products Co., New Britain, Conn.

COLPIN MAGNETO RE-CHARGER

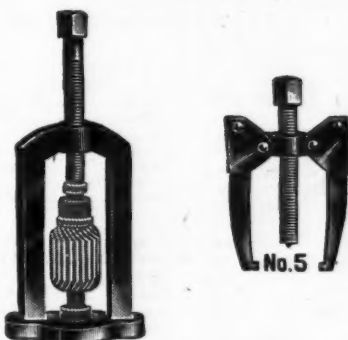
The Colpin Magneto Re-Charger for Ford cars does away, it is claimed, with all shorts in the magneto coil and re-charges the magneto to full strength in less than five minutes without removing a single bolt or nut. It operates from any alternating current light socket; will also operate from farm lighting plants, direct current, storage batteries or dry cells. Price \$57.50 complete. Magnetizer Mfg. Co., 146 W. Florence Ave., Los Angeles, Cal.



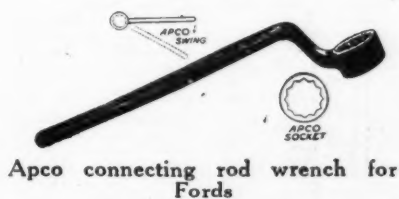
Plucker tes-tor



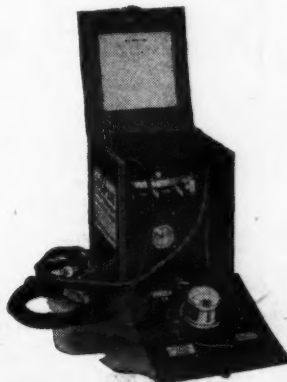
Dover automatic measuring can



Baby gear puller and generator bearing press



Apco connecting rod wrench for Fords



Colpin magneto re-charger for Fords

DOVER AUTOMATIC MEASURING CAN

The automatic measuring can pictured here is intended to register the correct amount delivered by the gasoline pump. If the flow is incorrect, either over or under, the amount shows on the dial.

Calibrated in cubic inches, it eliminates the use of the glass graduate. The gage is adjustable and can be sealed when properly set. Dover Stamping & Manufacturing Co., 385 Putnam avenue, Cambridge, Mass.

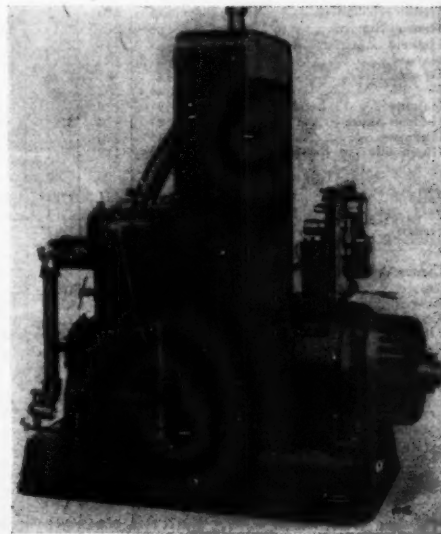
APCO CONNECTING ROD WRENCH FOR FORDS

This is a new one piece ratchet wrench for working on the fourth connecting rod of the Ford engine. The wrench is made in a forging and the particular feature of it is the fact that it gets twice as many grips as the regular socket wrench, because there are twice as many cuts. Price, 75 cents. The Apco Manufacturing Co., of Providence, R. I.

BABY GEAR PULLER AND GENERATOR BEARING PRESS

These two service shop tools are the productions of the Geo. L. Hunt Co., Boscobel, Wis. The Baby Gear Puller is designed to take the place of the large gear pullers in difficult jobs. It reaches all gears and bearings to 3 in. in diameter.

The Generator Bearing Press, together with the above instrument, completes, it is claimed, all that is necessary in a Ford electrical repair outfit. This press like the gear puller, is small and can be moved from one place to another without trouble. Price, complete, \$7.50.



Perfect-Lite power plant

Specifications of Current Passenger Car Models

NAME AND MODEL	Engine Make	Cylinders, Bore and Stroke	WB	Tires	2-Pass.	5-Pass.	7-Pass.	Coupe	Sedan	NAME AND MODEL	Engine Make	Cylinders, Bore and Stroke	WB	Tires	2-Pass.	5-Pass.	7-Pass.	Coupe	Sedan
Ambassador.....	R Cont.	6-3 1/2 x 5 1/4	136	33x5	14500	14500	14500	14500	14500	Maxwell.....	Own.	4-3 1/2 x 4 1/2	109	31x4	\$ 885	\$ 885	.....	\$1385	\$1485
American.....	C H.S.	6-3 1/2 x 5	127	32x4	\$2195	2195	2250	3150	3150	McFarlan.....	1921 Own.	6-4 1/2 x 6	140	33x5	6300	6300	7500	7500	7500
Anderson.....	Series 40 Cont.	6-3 1/2 x 4 1/2	120	33x4	2195	1650	1795	\$2450	2550	Mercer.....	Series 5 Own.	4-3 1/2 x 6 1/2	132	32x4 1/2	3950	3950	4850	5250	5250
Apperson.....	8-21-S Own.	8-3 1/2 x 5	130	34x4 1/2	2620	2645	3625	3695	3695	Merit.....	Cont.	6-3 1/2 x 4 1/2	119	32x4	1985	1985	.....	.....	.....
Auburn Beauty Six.....	6-51 Cont.	6-3 1/2 x 4 1/2	121	32x4	1575	1575	1615	2275	2395	Meteor.....	R & RR Dues.	4-4 1/2 x 6	129	32x4 1/2	5500	5500	.....	.....	.....
Auburn.....	Beauty Six Cont.	6-3 1/2 x 4 1/2	121	32x4 1/2	.....	2195	.....	.....	.....	Mitchell.....	F-50 Own.	6-3 1/2 x 5	120	33x4	11490	1490	1790	2290	2440
Beggs.....	20T Cont.	6-3 1/2 x 4 1/2	120	33x4	1775	1520	.....	2320	2420	Mitchell.....	F-50 Own.	6-3 1/2 x 5	127	33x4	.....	1795	.....	.....	.....
Bell.....	4-32 H.S.	4-3 1/2 x 5	114	31x4	.....	1195	.....	.....	.....	Monroe.....	1922-S-13 Own.	4-3 1/2 x 4 1/2	115	32x3 1/2	1295	1295	.....	.....	.....
Bell.....	6-50 H.S.	6-3 1/2 x 5	124	32x4	.....	1545	.....	.....	.....	Monroe.....	1922-S-14 Own.	4-3 1/2 x 4 1/2	115	33x4	.....	1785	1785	2285	2785
Biddle.....	B1 & B5 Buda.	4-3 1/2 x 5 1/2	121	32x4	3475	13475	.....	4350	.....	Moore.....	6-68 Cont.	6-3 1/2 x 5 1/2	125	32x4 1/2	.....	2285	.....	.....	.....
Brewster.....	91 Own.	4-4 x 5 1/2	125	32x4 1/2	16000	6000	.....	9200	9200	Murray-Mac Six.....	Own.	6-3 1/2 x 5 1/2	128	34x4 1/2	4250	4250	.....	.....	.....
Buick.....	1922-34-35-36-37 Own.	31x4	109	31x4	895	935	.....	1295	1395	Nash.....	681-7 Own.	6-3 1/2 x 5	121	33x4	1360	1390	1540	2090	2390
Buick.....	1922-44-5-6-7 Own.	33x4 1/2	118	33x4 1/2	1390	1395	.....	1885	2065	Nash Four.....	41-4 Own.	4-3 1/2 x 5	112	33x4	965	985	1485	1645	1645
Buick.....	1922-48-50 Own.	6-3 1/2 x 4 1/2	124	34x4 1/2	.....	1585	2075	2375	2375	National.....	BB Own.	6-3 1/2 x 5 1/2	130	32x4 1/2	2750	2750	3990	3990	3990
Cadillac.....	61 Own.	8-3 1/2 x 5 1/2	132	33x5	3100	3150	3150	3925	4100	Noma.....	3C Bea.	6-3 1/2 x 4 1/2	128	32x4 1/2	2000	2100	2200	3200	3200
Case.....	X Cont.	6-3 1/2 x 4 1/2	122	32x4 1/2	.....	1890	.....	2790	2790	Noma.....	1D Cont.	6-3 1/2 x 5 1/2	128	32x4 1/2	3000	3100	3200	5500	5500
Case.....	V Cont.	6-3 1/2 x 5 1/2	126	34x4 1/2	.....	1995	2885	2990	2990	Norwalk.....	430-KS Lye.	4-3 1/2 x 5	116	32x3 1/2	.....	1035	.....	.....	.....
Chalmers.....	6-30 Own.	6-3 1/2 x 4 1/2	117	32x4	1245	1295	1395	1995	2295	Oakland.....	6-44 Own.	6-2 1/2 x 4 1/2	115	32x4	1120	1145	1265	1685	1785
Chalmers.....	6-30 Own.	6-3 1/2 x 4 1/2	122	32x4	.....	1395	1995	.....	.....	Ogren.....	6 T De Luxe Cont.	6-3 1/2 x 5 1/2	134	33x5	4250	4250	4350	5200	5500
Champion.....	Tourist Lye.	4-3 1/2 x 5	113	32x3 1/2	.....	995	1995	.....	.....	Oldsmobile.....	43-A Own.	4-3 1/2 x 5 1/2	115	32x4	1145	1145	1645	1795	1795
Champion.....	Special H.S.	4-3 1/2 x 5	118	32x4	11095	1095	.....	2295	2395	Oldsmobile.....	46 Own.	8-2 1/2 x 4 1/2	122	32x4 1/2	1735	1735	2145	2295	2395
Chandler.....	Six Own.	6-3 1/2 x 5	123	33x4	1595	.....	1695	2295	2395	Oldsmobile.....	47 Own.	8-2 1/2 x 4 1/2	115	32x4	1595	1595	2145	2295	2395
Chevrolet.....	490 Own.	4-3 1/2 x 4	102	30x3 1/2	525	525	.....	875	875	Overland.....	4 Own.	4-3 1/2 x 4	100	30x3 1/2	595	595	.....	850	895
Chevrolet.....	FB Own.	4-3 1/2 x 4 1/2	110	32x4	975	975	.....	1575	1575	Packard.....	Single-Six Own.	6-3 1/2 x 4 1/2	116	33x4 1/2	2350	2350	3125	3350	3350
Cleveland.....	41 Own.	6-3 x 4 1/2	112	32x4	1175	1195	.....	1550	1595	Packard.....	Twin Six Own.	12-3 x 5	136	35x5	4850	4850	6000	6800	6800
Climber Four.....	K H.S.	4-3 1/2 x 5	115	33x4	1385	1385	.....	3000	3100	Paige.....	6-44 Own.	6-3 1/2 x 5	119	32x4	1465	1465	1995	2245	2245
Climber Six.....	S H.S.	6-3 1/2 x 5	125 1/2	32x4 1/2	2250	2250	.....	3000	3100	Paige.....	6-66 Cont.	6-3 1/2 x 5	131	33x4 1/2	2245	2495	2195	3100	3155
Cole.....	890 North.	8-3 1/2 x 4 1/2	127 1/2	33x5	2485	2485	3385	3685	3685	Pan American.....	6-55 H.S.	6-3 1/2 x 5	121	33x4	2000	2000	2100	2100	2100
Columbia Challenger.....	Rut.	6-3 1/2 x 5	115	32x4	.....	1195	1195	1995	1995	Pateras.....	22-6-52 Cont.	6-3 1/2 x 4 1/2	120	32x4 1/2	1550	1585	2595	2595	2595
Columbia.....	D-C&CS Cont.	6-3 1/2 x 4 1/2	115	32x4	1475	1475	1475	2295	2350	Peerless.....	56-S-7 Own.	8-3 1/2 x 5	125	34x4 1/2	2280	2880	3500	3700	3700
Comet.....	C-53 Cont.	6-3 1/2 x 5 1/2	125	33x4 1/2	.....	2350	2450	.....	3650	Piedmont.....	4-30 Lye.	4-3 1/2 x 5	116	32x3 1/2	.....	970	.....	.....	.....
Crawford.....	22-6-40 Cont.	6-3 1/2 x 5 1/2	122 1/2	32x4	2750	2750	2750	.....	4500	Piedmont.....	6-40 Cont.	6-3 1/2 x 4 1/2	122	32x4	1285	1285	.....	.....	.....
Crow-Elkhart.....	163-65 Lye.	4-3 1/2 x 5	117	32x3 1/2	1095	1095	.....	.....	.....	Pierce-Arrow.....	Own.	6-4 x 5 1/2	138	33x5	7000	16500	6500	8000	8500
Crow-Elkhart.....	163-65 H.S.	6-3 1/2 x 5	117	33x4	1345	1345	.....	2095	2095	Pilot.....	6-50 H.S.	6-3 1/2 x 5	126	32x4 1/2	2050	2000	2050	2900	3000
Daniels.....	D-19 Own.	8-3 1/2 x 5 1/2	132	34x4 1/2	15350	15350	5350	6250	6950	Porter.....	4-6 Own.	4-4 x 5 1/2	142	35x5	6750	6750	7800	7800	7800
Davis.....	61-67 Cont.	6-3 1/2 x 4 1/2	120	33x4	11895	1795	11895	2595	2595	Premier.....	6-40 Own.	6-3 1/2 x 5 1/2	126 1/2	33x5	3150	3100	3250	5000	5000
Dixie Flyer.....	H-S-70 H.S.	4-3 1/2 x 5	112	32x4	1195	1195	1195	1895	1895	Premcar.....	6-40 A Falls.	6-3 1/2 x 4 1/2	117	32x4	1295	1295	1945	1995	1995
Dodge Brothers.....	Own.	4-3 1/2 x 4 1/2	114	32x4	850	880	.....	1280	1440	R & V Knight.....	R Own.	4-3 1/2 x 5	116	32x4	2750	1850	2650	2750	2750
Dorris.....	6-40 Own.	6-4 x 5	132	33x5	14785	4785	5800	7190	7190	R & V Knight.....	J Own.	6-3 1/2 x 5 1/2	127	32x4 1/2	2750	2750	3350	3450	3450
Dort.....	19-14 D-Lye.	4-3 1/2 x 5	108	31x4	865	865	.....	1315	1445	Reo Series.....	B-T & U Own.	6-3 1/2 x 5	120	33x4	1595	1595	2355	2435	2435
Driggs.....	4-25 Own.	4-25 x 4 1/2	104	30x3 1/2	1275	1275	.....	1975	1975	Reo Series.....	C Dues.	4-4 1/2 x 6	131	32x4 1/2	3200	3200	4000	4000	4000
Duesenberg.....	Straight A Own.	8-2 1/2 x 5	134	33x5	6500	6500	6750	7800	7800	Reo Series.....	C Dues.	6-3 1/2 x 5 1/2	117	32x4	1485	1485	1885	1985	1985
Du Pont.....	A Own.	4-3 1/2 x 5 1/2	124	32x4 1/2	3000	3200	.....	3900	4000	Roamer.....	6-54-E Cont.	6-3 1/2 x 5 1/2	128	32x4 1/2	2850	2585	32750	3850	3850
Durant.....	A-22 Own.	4-3 1/2 x 4 1/2	109	31x4	890	890	.....	1365	1365	Roamer.....	4-75-E Dues.	4-4 1/2 x 6	128	32x4 1/2	3965	13585	13750	14650	14650
Durant.....	B-22 Anst.	6-3 1/2 x 4 1/2	123	32x4 1/2	1600	1650	.....	2250	2400	Rolls-Royce.....	Own.	6-4 1/2 x 4 1/2	143 1/2	33x5	U. S. Chassis Price	11750	.....	.....	.....
Earl.....	40 Own.	4-3 1/2 x 5 1/2	112	32x4	1485	1185	.....	1895	1895	Romer.....	R-22 Cont.	6-3 1/2 x 4 1/2	120	33x4	1975	1975	2050	2400	2700
Elcar.....	K-4 Lye.	6-3 1/2 x 5	118	33x4	1095	1095	1095	1345	1345	Saxon.....	125 Own.	4-3 1/2 x 5	112	32x4	1195	1195	1795	1795	1795
Elcar.....	7-R Cont.	6-3 1/2 x 4 1/2	118	33x4	1395	1395	1395	2065	2165	Sayers Six.....	DP Cont.	6-3 1/2 x 4 1/2	118	33x4	1695	1695	2795	2795	2795
Elgin.....	K-1 Falls.	6-3 1/2 x 4 1/2	118	33x4	1345	1295	1345	2195	2195	Seneca.....	L & O Lell.	4-3 1/2 x 4 1/2	108	30x3 1/2	945	945	.....	.....	.....
Essex.....	Own.	4-3 1/2 x 5	108 1/2	32x4	1095	1095	.....	1345	1895	Seneca.....	50 & 51 Lye.	4-3 1/2 x 5	112	31x4	1095	1095	.....	.....	.....
Falcon.....	4 Own.	4-3 1/2 x 5	115	32x4	1295	1295	.....	1990	2085	Southern Six.....	660-2 H.S.	6-3 1/2 x 5	127	32x4 1/2	2375	2375	2395	2395	2395
Falcon.....	6 Own.	6-3 1/2 x 5	115	32x4	1595	1595	.....	2295	2395	Sperling.....	Supr.	4-3 1/2 x 5	114	32x4	980	980	1685	1685	1685
Falcon, H.P.M.....	12-D22 Cont.	4-23x4	100	27x3 1/2	2800	3000	.....	4000	4000	Standard.....	J Own.	8-3 1/2 x 5	127	34x4 1/2	2500	2500	3250	3500	3500
Ferris.....	Series 60 Cont.	6-3 1/2 x 5 1/2	130	32x4 1/2	2575	.....	2475	3475	3475	Stanley Steamer.....	Own.	2-4 x 5	130	34x4 1/2	2800	2600	2775	3850	3850
Ferris.....	Series 70 Cont.	6-3 1/2 x 5 1/2	130	32x4 1/2	2895	.....	2795	3595	3595	Stanwood Six.....	Own.	6-3 1/2 x 4 1/2	118	33x4	1765	1765	2750	2750	2750
Ford.....	T Own.	4-3 1/2 x 4	109	30x3 1/2	1319	1348	.....	680	645	Stearns.....	SK Lye.	4-3 1/2 x 5 1/2	125	34x4 1/2	2250	2250	2450	3150	3450
Franklin.....	9-B Own.	6-3 1/2 x 4	115	32x4	2400	2450	.....	3200	3450	Stevens-Duryea.....	90 Own.	6-3 1/2 x 5 1/2	122	33x4 1/2	1675	1745	2650	2650	2650
Gardner.....	T-R & C Lye.	4-3 1/2 x 5	112	32x3 1/2	895	895	.....	1595	1595	Stevens-Duryea.....	E Own.	6-4 1/2 x 5 1/2	138	35x5	7250	16000	6800	.....	18900
Goodspeed.....	Own.	4-3 1/2 x 5 1/2	124	32x4 1/2	.....	5400	.....	.....	.....	Studebaker.....	Light Six Own.	6-3 1/2 x 4 1/2	112	32x4	1045	1045	1375	1750	1750
Grant.....	Own.	6-3 1/2 x 4 1/2	116	32x4	1385	1385	.....	1945	1895	Studebaker.....	Special Six Own.	6-3 1/2 x 5	119	32x4	1425	1475	1475	2150	2350
H.C.S.....	Weid.	4-3 1/2 x 5 1/2	120	32x4 1/2	2725	12775	.....	3450	3650	Studebaker.....	Big Six Own.	6-3 1/2 x 5	126	33x4 1/2	2850	1785	2500	2700	2700
Handley-Knight.....	Kn't. Own.	4-4 1/2 x 4 1/2	1																

Specifications of Current Motor Truck Models

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES	Final Drive	NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES	Final Drive	NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES	Final Drive			
				Front	Rear					Front	Rear					Front	Rear			
Acason	3/4	\$1050	3 1/2 x 5	34x5 1/2	34x5 1/2	W	Commerce, 18	2 1/2	\$2495	4 1/2 x 5 1/2	36x8 1/2	36x7 1/2	I	G.W.W.	1 1/2	\$1950	3 1/2 x 5 1/2	35x5	35x5	I
Acason, R	1 1/2	2260	3 1/2 x 5 1/2	36x3 1/2	36x5	W	Concord, A	2	3150	4 1/2 x 5 1/2	36x3 1/2	36x6	W	Garford, 15	1 1/2	1590	3 1/2 x 5 1/2	34x5 1/2	34x5 1/2	W
Acason, RB	1 1/2	2485	3 1/2 x 5 1/2	36x3 1/2	36x6	W	Concord, B	3	3600	4 1/2 x 5 1/2	36x4	36x8	W	Garford, 25	1 1/2	1990	3 1/2 x 5 1/2	36x3 1/2	36x4	W
Acason, H	2 1/2	3295	4 1/2 x 5 1/2	36x4	36x8	W	Concord, AX	2	3250	4 1/2 x 5 1/2	36x3 1/2	36x6	W	Garford, 70-H	2	2750	4 1/2 x 5 1/2	36x4	36x7	W
Acason, L	3 1/2	4295	4 1/2 x 5 1/2	36x5	36x10	W	Concord, BX	3	3600	4 1/2 x 5 1/2	36x4	36x8	W	Garford, 77D	3 1/2	4300	4 1/2 x 5 1/2	36x5	36x6d	W
Acason, M	5	5250	5 x 6 1/2	36x6	40x12	W	Cook, 51	2 1/2	3500	4 1/2 x 5 1/2	36x6	40x8 1/2	I	Garford, 68D	5	5200	5 x 6 1/2	36x6	40x6d	W
Ace, C	1 1/2	2205	3 1/2 x 5 1/2	34x3 1/2	34x5	W	Corbitt, H-22	1	1480	3 1/2 x 5	34x3 1/2	34x4	W	Garford, 150-A	7 1/2	5500	5x6 1/2	36x6	40x7d	W
Ace, A	2 1/2	2795	4 1/2 x 5 1/2	36x4	36x7	W	Corbitt, E-22	1 1/2	2200	3 1/2 x 5	34x3 1/2	34x4	W	Gary, F	1	2100	3 1/2 x 5	36x3 1/2	36x4	W
Acme, G	3/4	....	3 1/2 x 5	35x5 1/2	35x5 1/2	W	Corbitt, C-22	2	2600	4 1/2 x 5 1/2	36x3 1/2	36x6	W	Gary, I	1 1/2	2550	4 1/2 x 5 1/2	36x3 1/2	36x5	W
Acme, B	1	....	3 1/2 x 5	34x3 1/2	34x5	W	Corbitt, B-22	2 1/2	3000	4 1/2 x 5 1/2	36x4	36x7	W	Gary, J	2 1/2	3150	4 1/2 x 5 1/2	36x4	36x7	W
Acme, F	1 1/2	....	3 1/2 x 5	34x3 1/2	34x5	W	Corbitt, R-22	3	3200	4 1/2 x 5 1/2	36x4	36x8	W	Gary, K	3 1/2	4050	4 1/2 x 5 1/2	36x5	40x6d	W
Acme, A	2 1/2	....	4 1/2 x 5 1/2	36x4	36x7	W	Corbitt, A-22	3 1/2	3800	4 1/2 x 5 1/2	36x5	36x10	W	Gary, M	5	5150	5 x 6 1/2	36x6	40x6d	W
Acme, AC	2 1/2	....	4 1/2 x 5 1/2	36x4	36x7	W	Corbitt, AA-22	5	4500	4 1/2 x 5 1/2	36x6	40x6d	W	Geraix, M	1 1/2	3100	4 1/2 x 5 1/2	36x4	36x7	W
Acme, C	3 1/2	....	4 1/2 x 5 1/2	36x5	40x10	W	Day-Elder, AS	1	1600	3 1/2 x 5	35x5 1/2	35x5 1/2	W	Geraix, K	2 1/2	3500	4 1/2 x 5 1/2	36x4	36x8	W
Acme, E	5	....	4 1/2 x 5 1/2	36x6	40x12	W	Day-Elder, B	1 1/2	2000	3 1/2 x 5	34x3 1/2	34x5	W	Geraix, M	3 1/2	4500	4 1/2 x 5 1/2	36x5	40x12	W
Akr'n Multi-Trk20	1 1/2	1695	4 x 6	34x5	34x5	B	Day-Elder, D	2	2400	4 1/2 x 5 1/2	36x4	36x7	W	Golden West, GH	3 1/2	4500	4 1/2 x 5 1/2	36x7	36x7	W
American, 25	2 1/2	3350	4 x 6	36x4	36x4d	W	Day-Elder, C	2 1/2	2750	4 1/2 x 5 1/2	36x4	36x7	W	Golden West, G	3 1/2	5000	4 1/2 x 5 1/2	36x6	36x6	W
American, 40	4	4275	4 1/2 x 6	36x5	36x5d	W	Day-Elder, E	3 1/2	3150	4 1/2 x 5 1/2	36x5	36x5d	W	Graham Bros.	1-Ton	1370	3 1/2 x 4 1/2	36x4 1/2	34x5	B
Apex, G	1	1450	3 1/2 x 5	33x5 1/2	33x5 1/2	I	Day-Elder, F	5	4250	4 1/2 x 6	36x5	40x6d	W	Graham Bros. A	1 1/2	1430	3 1/2 x 4 1/2	36x4 1/2	36x6	B
Apex, D	1 1/2	1915	3 1/2 x 5 1/2	34x3 1/2	34x4	I	Dearborn, E	1	1600	3 1/2 x 5 1/2	35x5	35x5	W	Gramm-Pion. 10	1	1365	3 1/2 x 5	33x5 1/2	33x5 1/2	F
Apex, E	2 1/2	2695	4 1/2 x 5 1/2	36x4	36x7	I	Dearborn, FX	1 1/2	2300	3 1/2 x 5 1/2	34x4	34x5	W	Gramm-Pion. 15	1 1/2	1905	3 1/2 x 5	36x3 1/2	36x5	I
Apex, F	3 1/2	3975	4 1/2 x 6	36x5	36x10	I	Dearborn, G	1 1/2	2180	3 1/2 x 5 1/2	34x4	34x5	W	Gramm-Pion. 65	1 1/2	2500	3 1/2 x 5	36x3 1/2	36x5	W
Armleder, 20	1	....	3 1/2 x 5 1/2	34x3 1/2	34x5	W	Dearborn, 48	2	2590	3 1/2 x 5 1/2	34x4 1/2	34x7	W	Gramm-Pion. 20	2	2925	4 1/2 x 5 1/2	36x4	36x7	W
Armleder, 21	1 1/2	....	3 1/2 x 5 1/2	34x3 1/2	34x6	W	Defiance, G	1	1695	3 1/2 x 5	35x5 1/2	35x5 1/2	B	Gramm-Pion. 30	2 1/2	3275	4 1/2 x 5 1/2	36x4	36x4d	W
Armleder, 21	1 1/2	....	3 1/2 x 5 1/2	34x3 1/2	34x6	W	Defiance, D	1 1/2	2095	3 1/2 x 5	35x5 1/2	35x6 1/2	I	Gramm-Pion. 40	3 1/2	3995	4 1/2 x 5 1/2	36x5	36x6d	W
Armleder, 40	1 1/2	....	4 1/2 x 5 1/2	34x3 1/2	34x6	W	Defiance, E	2	2275	3 1/2 x 5	35x5 1/2	35x7 1/2	I	Gramm-Pion. 75-P	3 1/2	4225	4 1/2 x 5 1/2	36x6	42x6 1/2	W
Armleder, 40	1 1/2	....	4 1/2 x 5 1/2	34x3 1/2	34x6	W	DeMartini, 1 1/2	1 1/2	2600	3 1/2 x 5	34x3 1/2	34x6	W	Gramm-Pion. 50	5	4895	4 1/2 x 6	36x6	40x6d	W
Armleder, HW	2 1/2	....	4 1/2 x 5 1/2	36x4	36x7	W	DeMartini, 2	2	3300	4 1/2 x 5 1/2	36x3 1/2	36x7	W	Hahn, J4	1	....	3 1/2 x 5	34x5	34x5	W
Armleder, KW	3 1/2	....	4 1/2 x 5 1/2	36x5	36x5d	W	DeMartini, 3	3	4250	4 1/2 x 5 1/2	36x4	36x10	W	Hahn, CD	1 1/2	....	4 1/2 x 5 1/2	36x3 1/2	36x6	W
Atco, B	1 1/2	....	3 1/2 x 5 1/2	34x5 1/2	36x6 1/2	W	DeMartini, 4	4	4800	4 1/2 x 6	36x5	36x12	W	Hahn, EE	2 1/2	....	4 1/2 x 5 1/2	36x3 1/2	36x6	W
Atco, B1	1 1/2	....	3 1/2 x 5 1/2	34x5 1/2	36x6 1/2	W	Denby, 31	1 1/2	1485	3 1/2 x 5	35x6 1/2	35x7 1/2	B	Hahn, F	3 1/2	....	4 1/2 x 5 1/2	36x5	36x10	W
Atco, A	2 1/2	....	4 1/2 x 5 1/2	36x4	36x8	W	Denby, 33	1 1/2	2145	3 1/2 x 5	35x5 1/2	35x7 1/2	I	Hahn, EF	5	....	4 1/2 x 5 1/2	36x6	40x12	W
Atlas, M.D.	1	1185	3 1/2 x 5	32x4 1/2	32x4 1/2	W	Denby, 34	2	2295	3 1/2 x 5	36x3 1/2	36x6	I	Hal-Fur, E	1 1/2	2350	4 1/2 x 5 1/2	34x5 1/2	38x7	W
Atterbury, 20R	1 1/2	2475	3 1/2 x 5	34x3 1/2	34x5	W	Denby, 35	2 1/2	2795	4 1/2 x 5 1/2	36x4	36x7	I	Hal-Fur, B	2 1/2	3000	4 1/2 x 5 1/2	35x5	38x7	W
Atterbury, 7CX	2 1/2	3175	4 1/2 x 5 1/2	36x4	36x4d	W	Denby, 27	4	3895	4 1/2 x 5 1/2	36x6	36x5d	I	Hal-Fur, F	3 1/2	4000	4 1/2 x 5 1/2	36x6	40x10 1/2	W
Atterbury, 7D	3 1/2	3975	4 1/2 x 5 1/2	36x5	40x5d	W	Dependable, A	3 1/2	1650	3 1/2 x 5 1/2	34x5	36x6	W	Hall, 1 1/2	3 1/2	3100	3 1/2 x 5	34x5 1/2	38x7 1/2	W
Atterbury, 8E	5	4975	4 1/2 x 6	36x5	40x6d	W	Dependable, C	1 1/2	2350	3 1/2 x 5 1/2	34x3 1/2	34x5	W	Hall, 2 1/2	2 1/2	3275	4 1/2 x 5 1/2	36x4	36x6	W
Autocar, 21UF	1 1/2-2	1950	4 1/2 x 5 1/2	34x4	34x5	D	Dependable, D	2	2650	4 1/2 x 5 1/2	34x5	36x6	W	Hall, 3 1/2	3 1/2	4100	4 1/2 x 5 1/2	36x5	36x6d	W
Autocar, 21UG	1 1/2-2	2050	4 1/2 x 5 1/2	34x4	34x5	D	Dependable, E	2 1/2	2950	4 1/2 x 5 1/2	36x4	36x7	W	Hall, 5	5	5100	4 1/2 x 5 1/2	36x5	40x6d	W
Autocar, 27H	2	2950	4 1/2 x 5 1/2	34x5	36x7	D	Dependable, G	3 1/2	3550	4 1/2 x 6	36x6	36x7	W	Hall, 7 chain	7	5100	4 1/2 x 5 1/2	36x5	40x6d	C
Autocar, 26Y	5	3350	4 1/2 x 5 1/2	34x6	36x12	D	Diamond, T, O	1-1 1/2	1975	3 1/2 x 5 1/2	36x3 1/2	36x4 1/2	W	Harvey, WOA	2	2650	4 1/2 x 5 1/2	34x4	34x7	W
Autocar, 26-B	5	4100	4 1/2 x 5 1/2	34x6	36x12	D	Diamond, T, FS	1 1/2	2525	3 1/2 x 5 1/2	36x3 1/2	36x5	W	Harvey, WFA	2 1/2	2950	4 1/2 x 5 1/2	36x4	36x7	W
Available, H1 1/2	1 1/2	2475	4 1/2 x 5 1/2	36x3 1/2	36x5	W	Diamond, T, T	1 1/2	2250	3 1/2 x 5 1/2	36x3 1/2	36x5	W	Harvey, WHA	3 1/2	3950	4 1/2 x 5 1/2	36x5	36x6d	W
Available, H2 1/2	2 1/2	2775	4 1/2 x 5 1/2	36x4	36x8	W	Diamond, T, U	2	2650	4 1/2 x 5 1/2	36x4	36x7	W	Hawkeye, K	1 1/2	1850	4 1/2 x 5 1/2	34x3 1/2	34x5	I
Available, H3 1/2	3 1/2	4175	4 1/2 x 5 1/2	36x5	40x5d	W	Diamond, T, K	3 1/2	3750	4 1/2 x 5 1/2	36x5	36x5d	W	Hawkeye, M	2	2650	4 1/2 x 5	36x4	36x6	I
Available, H5	5	5375	4 1/2 x 6	36x6	40x12	W	Diamond, T, EL	5	4325	4 1/2 x 5 1/2	36x6	40x6d	W	Hawkeye, N	3 1/2	3700	4 1/2 x 5 1/2	36x5	36x10	I
Avery	1	....	3 x 4	34x5 1/2	34x5 1/2	I	Diamond, T, S	5	4500	4 1/2 x 6	36x6	40x6d	W	Hendrickson, N	2 1/2	3150	4 1/2 x 5 1/2	36x4	36x7	W
Beck, A Jr.	1	1950	3 1/2 x 5	34x3 1/2	34x4	I	Diehl, A	1	....	3 1/2 x 5	34x4 1/2	35x5	I	Huffman, B	1 1/2	3975	4 1/2 x 5	36x5	36x6d	W
Beck, C	2	2550	4 1/2 x 5 1/2	36x4	36x6	W	Diehl, B	1 1/2	....	3 1/2 x 5	36x6	36x6	I	Huffman, C	1 1/2	1995	3 1/2 x 5	34x3 1/2	34x6	W
Beck, M	1	1495	3 1/2 x 5 1/2	35x5	35x5 1/2	W	Dispatch, F	1	1350	3 1/2 x 5	34x4 1/2	34x4 1/2	I	Hurlbert, A	1 1/2	1795	3 1/2 x 5 1/2	34x3 1/2	34x6	I
Bell, E	1 1/2	2100	3 1/2 x 5 1/2	34x3 1/2	34x5	W	Doane	2 1/2	4100	4 1/2 x 5 1/2	36x5	36x7	C	Hurlbert, B	1 1/2	2850	4 1/2 x 5 1/2	34x4	34x5	W
Bell, O	2 1/2	2550	4 1/2 x 5 1/2	34x4	34x6	W	Dodge Brothers	6	6000	5 x 6 1/2	36x6	40x6d	C	Hurlbert, C	2 1/2	3750	4 1/2 x 5 1/2	36x5	36x6d	W
Belmont, A	1 1/2	725	3 1/2 x 4 1/2	31x4	31x4	B	Dorris, K-4	2-2 1/2	3400	4 1/2 x 5 1/2	36x4	36x7	W	Hurlbert, D	5	5500	4 1/2 x 6	36x5	40x6d	W
Belmont, D	2	2575	4 1/2 x 5 1/2	34x3 1/2	34x6	I	Dorris, K-7	3 1/2	4400	4 1/2 x 5 1/2	36x5	36x10	W	Indep't (Iowa), B	1	1695	3 1/2 x 5	34x3 1/2	34x4	I
Belmont, F	3	3500	4 x 6	36x5	36x5d	I	Dort, 103	3 1/2	685	3 1/2 x 5	31x4	31x4	B	Indep't (Iowa), G	1 1/2	2040	3 1/2 x 5 1/2	34x3 1/2	34x5	I
Bessemer, G	1	1395	3 1/2 x 5	35x5 1/2	35x5 1/2	I	Double Drive B	3	4000	4 1/2 x 5 1/2	6	6	W	Indep't (Ia.), H, I	2 1/2	2940	4 1/2 x 5 1/2	36x4	36x4	I
Bessemer, H-2	1 1/2	1995	3 1/2 x 5	36x3 1/2	36															

Specifications of Current Motor Truck Models—Continued

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES	Final Drive	NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES	Final Drive	NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES	Final Drive			
				Front	Rear					Front	Rear					Front	Rear			
*Kelly-S., K-50	5	.....	4 1/2x6 1/2	36x6	40x6d	C	Ogden, D	1 1/2	.....	3 1/2x5	36x3 1/2	36x5	W	Signal, R	5	\$4400	4 1/2x6	36x6	40x6d	W
*Kelly-S., K-60	6	.....	4 1/2x6 1/2	36x6	40x7d	C	Ogden, D	1 1/2	.....	3 1/2x5	36x3 1/2	36x5	W	Southern, 10	1	2090	3 1/2x5	34x3 1/2	34x4	W
Keystone, 40	2 1/2	\$2150	3 1/2x5 1/2	34x5 1/2	38x7 1/2	I	Ogden, E	2 1/2	.....	4 1/2x5 1/2	36x4	36x8	W	Southern, 15	1 1/2	2590	3 1/2x5 1/2	36x6 1/2	34x4	W
Kimball, AB	2 1/2	3675	4 x6	36x4	36x7	W	Old Hickory, W	1	1775	3 1/2x5	36x3 1/2	36x4	W	Southern, 20	2	2090	4 1/2x5 1/2	36x6 1/2	40x8*	W
Kimball, AC	2 1/2	3975	4 1/2x6	36x4	36x8	W	Old Reliable, A	1 1/2	2350	4 x5	34x4	36x6	W	Standard, 1-K	1 1/2	1600	3 1/2x5	34x3 1/2	34x5*	W
Kimball, AK	3	4500	4 1/2x6	36x4	36x10	W	Old Reliable, B	2 1/2	3500	4 1/2x6	34x4	36x4d	W	Standard, 76	2 1/2-3	2400	4 1/2x5 1/2	36x4	36x7*	W
Kimball, AE	4	5000	4 1/2x6	36x5	40x12	W	Old Reliable, C	3 1/2	4250	4 1/2x6	36x5	36x5d	W	Standard, 66	3 1/2-5	3150	4 1/2x5 1/2	36x5	36x10	W
Kimball, AF	5	5800	5 x6	36x6	40x7d	W	Old Reliable, D	5	5250	4 1/2x6	36x6	40x6d	W	Standard, 5-K	5-7	4400	4 1/2x6	36x6	40x12	W
Kissel, Express	1 1/2	1935 1/2	3 1/2x5 1/2	34x5 1/2	34x5 1/2	W	Old Reliable, KLM	7	6000	4 1/2x6 1/2	36x6	40x7d	C	Sterling, 1 1/2	1 1/2	2835	4 x5 1/2	36x3 1/2	36x5*	W
Kissel, Utility	1 1/2	1975	3 1/2x5 1/2	36x3 1/2	36x5	W	Oldsmobile Econ.	1	1095	3 1/2x5 1/2	35x5 1/2	35x5 1/2	I	Sterling, 2	2	3085	4 x5 1/2	36x4	36x6*	W
Kissel, Freight	2 1/2	2875	4 1/2x5 1/2	36x4	36x7	W	Olympic, A	2 1/2	3200	4 1/2x5 1/2	35x5 1/2	36x8	W	Sterling, 2 1/2	2 1/2	3290	4 1/2x5 1/2	36x4	36x4d*	W
Kissel, H. D.	4	3675	4 1/2x5 1/2	36x5	36x5d	W	Oshkosh, A	2	3750	3 1/2x5	36x6 1/2	36x6 1/2	4	Sterling, 3 1/2	3 1/2	4325	4 1/2x5 1/2	36x5*	40x5d*	W
Kleiber, AA	1 1/2	2000	4 1/2x5 1/2	34x5 1/2	34x5*	W	Oshkosh, AA	2 1/2	3850	3 1/2x5	36x6 1/2	36x6 1/2	4	Sterling, 5-W	5	4950	5 x6 1/2	36x6*	40x6d*	W
Kleiber, AB	1 1/2	3100	4 1/2x5 1/2	36x3 1/2	36x6*	W	Oshkosh, B	2 1/2	4150	4 x5 1/2	38x7 1/2	38x7 1/2	4	Sterling, 5-C	5	5500	5 x6 1/2	36x6	40x6d	C
Kleiber, BB	2 1/2	3600	4 1/2x5 1/2	36x4	36x7*	W	Oshkosh, BB	2 1/2	4300	4 x5 1/2	38x7 1/2	38x7 1/2	4	Sterling, 7 1/2	7 1/2	6000	5 x6 1/2	36x6	40x7d	C
Kleiber, B	2 1/2	3950	4 1/2x5 1/2	36x5*	36x8	W	Packard, EC	1 1/2-3	3500	4 1/2x5 1/2	36x4	36x7	W	Stewart, 14	1 1/2	1195	3 1/2x5 1/2	32x4 1/2	32x4 1/2	I
Kleiber, C	2 1/2	4600	4 1/2x5 1/2	36x5	36x5d	W	Packard, EX	1 1/2-3	4000	4 1/2x5 1/2	36x6 1/2	40x8 1/2	W	Stewart, 15	1	1395	3 1/2x5 1/2	35x5 1/2	35x5 1/2	I
Kleiber, D	5	5300	5 x6 1/2	36x6	40x12	W	Packard, ED	2-4 1/2	4100	4 1/2x5 1/2	36x5	36x5d	W	Stewart, 9	1 1/2	1790	3 1/2x5 1/2	34x3 1/2	34x5	I
Koehler, D	1 1/2	1995	3 1/2x5 1/2	34x3 1/2	34x5	W	Packard, EF	4-7 1/2	4500	5 x5 1/2	36x6	40x6d	W	Stewart, 7-X	2	2090	4 1/2x5 1/2	34x4	34x7	I
Koehler, M	2 1/2	3175	4 x5 1/2	36x4	36x7	W	Paige, 52-19	1 1/2	1950	4 x5 1/2	34x3 1/2	34x5	W	Stewart, 10-X	2 1/2	2290	4 1/2x5 1/2	34x4	34x7	I
Koehler, MCS	2 1/2	3275	4 x5 1/2	36x4	36x7	W	Paige, 54-20	2 1/2	2420	4 1/2x5 1/2	34x4	34x8	W	Stewart, 10	3 1/2	3000	4 1/2x5 1/2	36x4	36x5d	I
Koehler, F	3 1/2	4150	4 1/2x5 1/2	36x5	36x10	W	Paige, 51-18	3 1/2	3145	4 1/2x5 1/2	36x5	36x5d	W	Stewart, 10-X	3 1/2	3850	4 1/2x6	36x5	36x5d	I
Koehler, MT, Trac	2 1/2	3275	4 x5 1/2	36x4	36x7	W	Parker, F20	2	3500	4 x6	34x4	36x4d	W	Stoughton, C	1	1240	3 1/2x5	34x4 1/2	34x4 1/2	W
Lange, B	2 1/2	3350	4 1/2x5 1/2	36x4*	36x7*	C	Parker, J20	3 1/2	4400	4 1/2x6	36x5	40x5d	W	Stoughton, A	1	1995	3 1/2x5 1/2	34x4 1/2	35x5 1/2	W
Larrabee, X-Z	1 1/2	1925	3 1/2x5 1/2	34x5*	34x5 1/2	B	Parker, M20	5	5500	4 1/2x6	36x6	40x6d	W	Stoughton, B	1 1/2	2350	3 1/2x5 1/2	36x4	36x7	W
Larrabee, U	1 1/2	2400	3 1/2x5 1/2	34x3 1/2	34x5	W	Patriot, Reverse	1	1500	3 1/2x5	35x5 1/2	35x5 1/2	W	Stoughton, D	2	2800	4 x5 1/2	36x4	36x7	W
Larrabee, K	1 1/2	3200	4 1/2x5 1/2	36x4	36x7	W	Patriot, Lincoln	2	2050	4 x5 1/2	34x3 1/2	34x5	W	Stoughton, F	3	3600	4 1/2x5 1/2	36x5d	36x5d	W
Larrabee, L-4	3 1/2	4000	4 1/2x5 1/2	36x5	36x5d	W	Patriot, Wash'n	3	2900	4 1/2x5 1/2	36x4	36x7	W	Sullivan, E	3 1/2	2750	4 1/2x5 1/2	36x4	36x7*	W
Larrabee, W	5	4800	4 1/2x6	36x6	40x6d	W	Piedmont, 4-30	1	1200	3 1/2x5	34x4 1/2	34x4 1/2	W	Sullivan, H	3 1/2	3750	4 1/2x6	36x5	36x5d	W
Luedinghaus, C	1 1/2	1605	3 1/2x5	35x5 1/2	35x5 1/2	W	Pierce-Arrow	2	3200	4 x5 1/2	36x4	36x4d	W	Superior, D	1	1650	3 1/2x5	34x4 1/2	34x4	I
Luedinghaus, W	1 1/2	2400	3 1/2x5 1/2	34x3 1/2	34x5*	W	Pierce-Arrow	3 1/2	4350	4 1/2x6 1/2	36x5	36x5d	W	Superior, E	2	2600	4 1/2x5 1/2	36x4	36x6	I
Luedinghaus, K	2-2 1/2	3150	4 1/2x5 1/2	36x4	36x7*	W	Pioneer, 59	5	4850	4 1/2x6 1/2	36x5	40x6d	W	Super Truck, 50	2 1/2	3300	4 x6	36x4	36x8	W
Maccari, L	2 1/2	2700	4 1/2x5 1/2	36x4	36x6	W	Pittsburgher	1 1/2-2	1550	3 1/2x5	36x4 1/2	36x5	W	Super Truck, 70	3 1/2	4300	4 1/2x6	36x5	40x5d	W
Maccari, H-A	3	3100	4 1/2x5 1/2	36x4	36x4d	W	Pittsburgher	3	3900	3 1/2x5	36x4	36x6	W	Super Truck, 100	5	5300	4 1/2x6	36x5	40x12	W
Maccari, H-2	3	3400	4 1/2x5 1/2	36x4	36x5d	W	Pittsburgher	3 1/2	3900	3 1/2x5	36x4	36x6	W	Super Truck, 150	7 1/2	6300	5 x6	36x6	40x7d	W
Maccari, H-3	4	4200	4 1/2x6	36x5	36x6d	W	Power, C	2	3150	3 1/2x5 1/2	36x5	36x7	W	Texas, A38	3 1/2	1095	3 1/2x5	33x4	33x4	I
Maccari, G	5-6	4950	4 1/2x6	36x5	40x6d	W	Power, C	3 1/2	4250	4 1/2x5 1/2	36x5	40x10	W	Texas, TK39	1 1/2	1550	3 1/2x5	36x6	36x7	W
MacDonald, A	7 1/2	5750	4 1/2x6	40x7	40x14	I	Premcar, B-143	1 1/2	2475	3 1/2x5	36x6 1/2	36x6 1/2	W	Tiffin, GW	1 1/2	2100	4 1/2x5 1/2	36x3 1/2	36x5	W
Mack, AB D.R.	1 1/2	3450	4 x5	36x4	36x3 1/2	W	Rainier, R-21	1 1/2	1990	3 1/2x5	35x5 1/2	35x5 1/2	W	Tiffin, MW	2 1/2	2700	4 1/2x5 1/2	36x4	36x3 1/2	W
Mack, AB Chain	1 1/2	3000	4 x5	36x4	36x3 1/2	W	Rainier, R-19	1	2150	3 1/2x5	34x3 1/2	34x4	W	Tiffin, PW	2 1/2	3600	4 1/2x5 1/2	36x5	40x5d	W
Mack, AB Chain	2 1/2	3200	4 x5	36x4	36x4d	D	Rainier, R-16	1 1/2	2490	3 1/2x5	34x3 1/2	34x5	W	Tiffin, F50	5	4300	4 1/2x6	36x6	40x6d	W
Mack, AB D.R.	2 1/2	3750	4 x5	36x4	36x4d	D	Rainier, R-18	2	2890	4 1/2x5 1/2	34x4	34x6	W	Tiffin, F60	6	4500	4 1/2x6	36x6	40x12	W
Mack, ABDR	2 1/2	3850	4 x5	36x4	36x4d	D	Rainier, R-20	2 1/2	3550	4 1/2x5 1/2	34x4	34x7	W	Titan	2	2950	4 1/2x5 1/2	36x4	36x7	I
Mack, AB	2 1/2	3400	4 x5	36x4	36x4d	C	Rainier, R-15	3 1/2	4400	4 1/2x5 1/2	36x5	36x5d	W	Titan	3 1/2	3950	4 1/2x5 1/2	36x5	40x10	I
Mack, AC Chain	2 1/2	4950	5 x6	36x5	40x5d	C	Rainier, R-17	5	5100	4 1/2x6	36x6	36x6d	W	Titan	5	4550	4 1/2x6	36x5	40x6d	I
Mack, AC Chain	3 1/2	5500	5 x6	36x6	40x6d	C	Ranger, TK-22-2	5	4400	4 1/2x6	36x6	36x6d	W	Tower, 6-Ton	6	5150	4 1/2x6	36x5	40x12	I
Mack, AC Chain	6 1/2	5750	5 x6	36x6	40x12	C	Reo, F	3 1/2-11	1245	4 1/2x5 1/2	34x4 1/2	34x4 1/2	B	Tower, H	1 1/2	2900	4 1/2x5 1/2	36x4	36x7	W
Mack, AC Chain	7 1/2	6000	5 x6	36x7	40x7d	C	Reliance, 10A	1 1/2	2400	4 x5 1/2	36x3 1/2	36x5	I	Tower, J	2 1/2	3200	4 1/2x5 1/2	36x4	36x7	W
Mack Trac, AB	5	3400	4 x5	36x4	36x4d	C	Reliance, 20B	2 1/2	3100	4 1/2x5 1/2	36x4	36x4d	I	Tower, G	3 1/2	4100	4 1/2x5 1/2	36x5	36x5d	W
Mack Trac, AC	7	4950	5 x6	36x5	40x5d	C	Republic, 75	1 1/2	1395 1/2	3 1/2x5	32x4 1/2	32x4 1/2	I	Traffic, C	...	1595	3 1/2x5	34x3 1/2	34x5*	I
Mack Trac, AC	10	5500	5 x6	36x6	40x6d	C	Republic, 10	1	1395	3 1/2x5	34x3	34x4	I	Traffic	3	1895	3 1/2x5	36x4	36x7	I
Mack Trac, AC	13	5750	5 x6	36x6	40x12	C	Republic, 10Exp.	1	1695	3 1/2x5	35x5 1/2	34x5 1/2	I	Transport, 20	1	1395	3 1/2x5 1/2	34x3 1/2	34x4	I
Mack Trac, AC	15	6000	5 x6	36x7	40x7d	C	Republic, 11X	1 1/2	1795	3 1/2x5	34x3 1/2	34x6	I	Transport, 30	1 1/2	1995	3 1/2x5 1/2	36x4	36x5	I
Mapleleaf, AA*	2	3775	4 x5 1/2	36x4	36x7	W	Republic, 19	2 1/2	2195	4 1/2x5 1/2	36x4	36x7	I	Transport, 50	2 1/2	2785	4 1/2x5 1/2	36x4	36x7	I
Mapleleaf, BB*	3	4350	4 1/2x5 1/2	36x4	36x4d	W	Republic, 20	3 1/2	3095	4 1/2x5 1/2	36x5	36x10	W	Transport, 70	3 1/2	3885	4 1/2x6	36x5	36x10	I
Mapleleaf, CC*	4	5100	4 1/2x5 1/2	36x5	36x5d	W	Rowe, CW	1 1/2	3000	3 1/2x5	36x6 1/2	36x6 1/2	W	Traylor, B	1 1/2	2390	4 1/2x5 1/2	34x3 1/2	34x5	W
Mapleleaf, DD*	5	6200	4 1/2x5 1/2	36x6	40x6d	W	Rowe, C. D. W.	2	3300	4 x5	34x4	36x3 1/2	W	Traylor, C	2	2850	4 x6	36x4	36x7	W
Master, JW	1 1/2	2690	4 1/2x5 1/2	34x3 1/2	34x5	W	Rowe, G. S. W.	3	4150	4 x6	34x5	36x5d	W	Traylor, D	3	2300	4 x6	36x4	36x8*	W
Master, W	2 1/2	3290	4 1/2x5 1/2	34x																

Specifications of Current Motor Truck Models—Continued

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES		Final Drive	NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES		Final Drive	NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES		Final Drive
				Front	Rear						Front	Rear						Front	Rear	
Ward-Laf. 2B	2½	\$2990	4½x5½	36x4	36x4d	W	Wichita, RX	3	\$3500	4½x5½	36x4*	36x8*	W	Winther, 430	1½	\$2850	3½x5	32x4	32x4	1
Ward-Laf. 4A	3½	3900	4½x6½	36x5	36x5d	W	Wichita, O	4	3900	4½x6½	36x5*	36x5d*	W	Winther, 39	1½	2450	3½x5	34x3½	34x5	1
Ward-Laf. 5A	5	4590	5 x6½	36x6	40x6d	W	Wilcox, AA	1	1900	3½x5½	36x4*	36x4*	W	Winther, 49	2	3250	4 x5	34x4	34x4d	1
Watson, B	1	1685	3½x5½	35x5½	35x5½	W	Wilcox, BB	1½	2550	4½x5	36x4	36x5	W	Winther, 50	2½	3995	4 x5	38x7½	42x9½	1
Watson, N	3½	3835	4½x5½	36x5	36x10	W	Wilcox, D	2½	3000	4½x5	36x4*	36x3½d*	W	Winther, 70	3½	4200	4 x5	36x5	36x5d	1
Western, W1½	1½	2550	4½x5½	36x3½*	36x5*	W	Wilcox, E	3½	3950	4½x5	36x5*	36x5d*	W	Winther, 450	2½	3690	4 x5	34x5	36x6	1
Western, W1½	1½	2550	4½x5½	36x3½*	36x5*	W	Wilcox, F	5	4350	4½x6½	36x5	40x6d	W	Winther, 109	5	5250	4½x6	36x6	40x5d	1
Western, W2½	2½	3250	4½x6	36x4	36x7	W	Wilson, G	1½	2270	3½x5	36x3½	36x5	W	Winther, 140	7	5900	5 x6	36x6	40x7d	1
Western, W2½	2½	3250	4½x6	36x4	36x7	W	Wilson, EA	2½	2825	4½x5½	36x4	36x7	W	Wisconsin, B	1	1750	3½x5	34x5½	34x5½	W
Western, W3½	3½	4250	4½x6½	36x5	40x5d	W	Wilson, G	3½	3885	4½x5½	36x5	36x5d	W	Wisconsin, C	1½	2500	4½x5½	36x6	36x6	W
White, 15	2	2100	3½x5½	34x5½	34x5½	D	Wilson, H	5	4520	4½x6	36x6	40x6d	W	Wisconsin, F	2	3000	4½x5½	38x7	40x8	W
White, 20	2	3250	3½x5½	36x4*	36x7	D	Winther, 751	1	1795	3½x5	34x4½	35x5½	1	Wisconsin, D	2½	3500	4½x6½	36x6	36x10	W
White, 40	3½	4200	3½x5½	36x5	40x5d	D								Wisconsin, C	3½	4000	5 x6½	36x6	36x12	W
White, 45	5	4500	4½x5½	36x6	40x6d	D								Witt-Will, N	1½	2250	3½x5	36x3½*	36x5*	W
White Hick., E	1	1225	3½x5	34x5½	34x5½	W								Witt-Will, P	2	2750	4½x5½	36x3½*	36x7*	W
White Hick., H	1½	1375	3½x5	36x3½	36x5	W								Wolverine, J	1½	2125	3½x5	34x3	34x4	1
White Hick., K	2½	1675	4½x5½	36x4	36x5	W								Wolverine, J	1½	2375	3½x5	34x3½	34x5	1
Wichita, K	1	2000	3½x5½	36x3*	36x4*	W								Wolverine, J	2	2640	3½x5	34x4	34x7	1
Wichita, M	2	2500	3½x5½	36x3½*	36x6*	W								Wolverine, J	2½	3425	4½x5½	36x5	36x10	1

*2-cyl. †6-cyl. ‡8-cyl. All others, not marked, are 4-cyl.
 Trac., Tractor. *Canadian made.
 Final Drive: W—Worm, I—Internal Gear, C—Chains, D—Double Reduction, B—Bevel, 4—Four-Wheel, E—External Gear.
 *Tires—optional. †Pneumatic Tires. All others solid.
 †Price includes body. ‡Price includes several items of equipment.

Farm Tractor Specifications and Prices

TRADE NAME	Rating	Price	Wheels or Crawlers	Engine	Cylinders: Bore, Stroke	Fuel	Pump Capacity	TRADE NAME	Rating	Price	Wheels or Crawlers	Engine	Cylinders: Bore, Stroke	Fuel	Pump Capacity	TRADE NAME	Rating	Price	Wheels or Crawlers	Engine	Cylinders: Bore, Stroke	Fuel	Pump Capacity
All-In One	16-30	\$1975	3	Clim.	4-5 x6½	GDK	3-4	Grain Belt... A	18-36	\$2150	4	Wauk.	4-4½x6½	G or K	4	Port Huron... A	12-25	\$1500	4	Chief	4-3½x6	G,K	3
Allis-Chalm. B	6-12	925	2	LeR.	4-3½x4½	Gas.	1	Gray... 1920	18-36	2000	3	Wauk.	4-4½x6½	Gas.	4	Ranger Cul. T-20	8-16	.....	4	LeR.	4-3½x4½	Gas.	1
Allis-Chalm. G.P	6-12	925	2	LeR.	4-3½x4½	Gas.	1-2	Ground Hog	19-31	2000	4	Erd.	4-4 x6	G or K	3	Reed... A-1	15-30	2185	4	Wauk.	4-4½x6½	G or K	3-4
Allis-Chalm. 12-30	1350	4	Midw.	4-4½x5½	Gas.	2-3	2-3	Gt. Western St	20-30	1950	4	Beav.	4-4½x6	K	4	Reed... A-1	18-36	2185	4	Wauk.	4-5 x6½	Gas.	4
Allis-Chalm. 18-30	2150	4	Own	4-4½x6½	G,K	3-4	2-3	Hart-Parr... 20	20	945	4	Own	2-5½x6½	K,D	2	Reliable...	10-20	885	4	Own	2-6 x7	Ker.	2
Allis-Chalm. 18-30	875	4	Own	4-4½x6½	G,K	3-4	2-3	Hart-Parr... 30	30	1295	4	Own	2-6½x7	K,D	3	Rex...	12-25	1600	4	Wauk.	4-4½x5½	G or K	3
Allwork... 2-G	14-28	1775	4	Own	4-4½x6	GorK	3	Heider... D	9-16	1170	4	Wauk.	4-4½x6½	G,K	2	Russell...	12-24	1500	4	Own	4-4½x5½	G or K	2-3
Allwork... C	14-28	1825	4	Own	4-5 x6	GorK	3	Heider... C	12-20	1395	4	Wauk.	4-4½x6½	G,K	3	Russell...	15-30	2200	4	Own	4-5 x6½	G or K	3-4
Andrews-Kin.D	18-36	2500	4	Clim.	4-5 x6½	GorK	3	Heider... Cult	6-10	1050	4	LeR.	4-3½x4½	Gas.	1	Russell...	20-35	3000	4	Own	4-5½x7	G or K	4-5
Appleton...	12-20	1500	4	Buda	4-4½x5½	G,K	2-3	Hicks...	20-30	1185	4	Wauk.	4-4½x6	G or K	3	Russell...	30-60	5000	4	Own	4-8 x10	G or K	8-10
ARO... 1921-22	3-5	495	4	Own	1-4½x5	Gas.	1	Huber Light 4	15-30	1885	4	Midw.	4-4½x6	Gas.	3	Samson... M	.....	445	4	Nor	4-4 x5½	G,K	2
Aultman-T...	15-30	2200	4	Clim.	4-5 x6½	G,K	3	Huber Super 4	15-30	1885	4	Midw.	4-4½x6	Gas.	3	Sandusky... J	10-20	1250	4	Own	4-4½x5½	G,K,D	2
Aultman-T...	22-45	3420	4	Own	4-5½x6	G,K	6	Illinois, Super-Drive	18-30	.....	4	Clim.	4-5 x6½	G,K	4	Sandusky... E	15-35	1750	4	Own	4-5 x6½	G,K,D	4
Aultman-T...	30-60	4500	4	Own	4-7 x9	G,K,D	2-3	Imperial... E	40-70	4500	4	Own	4-7½x9	G,K,D	10	Shawnee Com.	6-12	.....	2	LeR.	4-3½x4½	Gas.	1
Automot. B-3	12-24	1785	4	Here.	4-4 x5	G,K	2-3	Indiana... F	5-10	895	2	LeR.	4-3½x4½	Gas.	1-2	Shawnee Com.	9-18	.....	2	Gray	4-3½x4½	Gas.	1
Avery, S.R. Cul.	5-10	.....	3	Own	4-3 x4	G,K	2	International	8-16	1670	4	Own	4-4½x5	G,K,D	2	Shelby... D	15-30	.....	4	Beav.	4-4½x6	G,K	3
Avery... Cult-C	5-10	.....	3	Own	4-3 x4	G,K	2	Internatl.Titan	15-30	1700	4	Own	5½x8	G,K,D	4	Shelby... C	10-20	.....	4	Erd.	4-4 x6	G or K	2-3
Avery... B	5-10	.....	4	Own	4-3 x4	G,K	2	J-T...	20-40	.....	2	Chief	4-4½x6	G,K,D	3-4	Short Turn	20-40	1500	3	Beav.	4-4½x6	G,K	3
Avery...	8-16	.....	4	Own	2-5½x6	G,K,D	2-3	Klumb...	16-32	1475	4	Clim.	4-5 x6½	Gas.	4-6	Steady Pull	12-24	1485	4	Own	4-4 x5	Gas.	3
Avery...	12-20	.....	4	Own	4-4½x6	G,K,D	2-3	Klumb... 1920	25-45	2500	4	Own	4-5 x9	Gas.	4-6	Stinson... 4E	18-36	1835	4	Beav.	4-4½x6	G,K	4
Avery...	12-25	.....	4	Own	4-4½x6	G,K,D	2-3	Knudsen. 1920	16-32	1475	4	Clim.	4-5 x6½	Gas.	4-6	Stone...	20-40	2250	4	Beav.	4-4½x6	G,K	4
Avery...	14-28	.....	4	Own	4-4½x6	G,K,D	3-4	LaCrosse... M	6-12	650	4	Own	2-4 x6	G,K	1	Tioga...	15-27	2625	4	Wisc.	4-4½x6	Gas.	3-4
Avery...	18-36	.....	4	Own	4-5½x6	G,K,D	4-5	LaCrosse... G	12-24	985	4	Own	2-6 x7	G or K	3	Titan...	10-20	900	4	Own	2-6½x8	G,K,D	3
Avery...	25-50	.....	4	Own	4-6½x7	G,K,D	5-6	Lauson...	5-10	895	2	Midw.	4-4½x5½	Gas.	3	Topp... B	30-45	3500	4	Wauk.	4-4½x6½	Gas.	3-4
Avery...	45-65	.....	4	Own	4-7½x8	G,K,D	8-10	Lauson... 20	15-25	1685	4	Beav.	4-4½x6	G or K	3-4	Toro Cultivator	6-10	.....	3	LeR.	4-3½x4½	Gas.	2
Bates...	15-25	.....	4	Own	4-4½x6	Ker.	3	Lauson... 21	15-30	1985	4	Beav.	4-4½x6	G or K	3-4	Townsend...	10-20	895	2	Own	4-6½x7	Ker.	2-3
Bates Mule. H	15-25	.....	4	Midw.	4-4½x5½	Gas.	3	Larson Road	15-30	2225	4	Beav.	4-4½x6	G,K	3	Townsend...	15-30	1485	2	Own	4-7 x8	Ker.	3-4
Bates Mule. F	18-25	.....	2	Midw.	4-4½x5½	Gas.	3	Leader...	12-18	1095	4	Own	2-6 x6½	G,K,D	2-3	Townsend...	25-50	2750	2	Own	4-8½x10	Gas.	4-8
Bates Mule. G	25-35	.....	2	Midw.	4-4½x6	Gas.	com.	Leader... GU	18-35	2775	2	Clim.	4-5 x6½	G,K	3-4	Traction Motor	40-50	.....	4	...	8-3½x5	Gas.	4-5
Beeman... G	2-4	315	4	Own	1-3½x4½	Gas.	...	Leonard...	16-32	1985	4	Clim.	4-5 x6½	G,K	3	Traylor... TB	6-12	715	4	LeR.	4-3½x4½	Gas.	1-2
Best...	30	3100	2	Own	4-6½x8½	G,K,D	8-9	Leader... GU	18-35	2775	2	Clim.	4-5 x6½	G,K	3-4	Triumph... H	18-36	2450	2	Erd.	4-4½x6	Ker.	4
Best...	60	5450	2	Own	4-6½x8½	G,K,D	8-9	Leonard... E	20-30	2530	4	Buda	4-4½x6	G,K	3	Trundar...	10-25	4075	2	Wauk.	4-5 x6½	G or K	4
Boring... 1921	16-30	1850	3	Wauk.	4-4½x5½	GorK	3	Linn... HJ	40	4500	*	Cont.	4-4½x6½	Gas.	4	Turner... 1921	14-25	1295	4	Buda	4-4½x5½	G,K	3
Burn-Oil, 1922	15-30	1495	4	Own	4-4½x6	G,K	3	Linn... W	60	5100	*	Wauk.	4-5 x6½	Gas.	6	Twin City...	12-20	1580	4	Own	4-4½x6	G,K	3
Capital...	10-13	800	2	Own	2-6½x7	Gas.	3	Little Giant, B	16-22	2200	4	Own	4-4½x5	K	4	Twin City...	20-35	3175	4	Own	4-5½x6½	G,K	5
Case...	15-27	1680	4	Own	4-3½x5	GorK	3	Little Giant, A	26-35	3300	4	Own	4-5½x6	K	6	Twin City...	40-65	5250	4	Own	4-7½x9	G,K	8
Case...	22-40	3100	4	Own	4-4½x6	GorK	3	Lombard 1921	85-150	.....	2	...	6-5½x6½	Gas.	10	Uncle Sam C20	12-20	1385	4	Weid.	4-4 x5½	G	2-3
Caterpillar T11	25	3975	2	Own	4-4½x6	GorK	4-5	Lombard 1921	50	.....	2	...	4-4½x6½	Gas.	6-10	Uncle Sam B19	20-30	2300	4	Beav.	4-4½x6	G or K	3-4
Caterpillar T16	40	6050	2	Own	4-6½x7	G,K	6	Magnet...	14-28	1875	4	Wauk.	4-4½x6½	K&G	3	Uncle Sam D21	20-30	1985	4	Beav.	4-4½x6	G or K	3-4
Centaur...	5-2½	385	2	N Wauk	2-4½x4½	Gas.	1	Master Jr.	5-10	585	2	LeR.	4-3½x4½	Gas.	1	Universal...	1-4	475	2	Own	1-3½x4½	G	1
Chase...	12-25	1725	3	Buda	4-4½x5½	GorK	2-3	Merry Gar 1921	2	230	2	Evin	1-2½x2½	Gas.	3	Utiliter... 501	2½-4	380	4	Own	1-3½x4½	G	1
Cletrac... 40	40	3500	2	Own	4-4½x6	GorK	2-3	Minne... All-P	12-25	900	4	Own	4-4½x7	G or K	3	Vim...	15-30	1650	4	Wauk.	4-4½x5½	G,K	3
Cletrac... W	12-20	1455	2	Own	4-3½x4½	G,K,D	2-3	Minne... Gen-P	17-30	1675	4	Own	4-4½x7	G or K	3-4	Wallis... K	15-25	1905	4	Own	4-4½x5½	G,K	3
Dakota...	4	15-27	3	Dom.	4-4½x6	Gas.	3	Minne...	22-44	3000	4	Own	4-6 x7	G or K	5-6	Waterloo... N	12-25	1450	4	Own	2-6½x7	G,K	3
Dart... B.J.	15-30	1800	4	Buda	4-4½x6	Gas.	3-4	Med.Duty	35-70	4150	4	Own	4-7½x9	G or K	8-9	Webfoot... 53	28-53	5000	2	Wisc.	4-5½x7	G,D	6
Depue... A	20-30	2500	4	Buda	4-4½x6	Gas.	4	Minne...	8-16	785	2	Light	4-3½x4½	K or G	1-2	Wellington B	12-22	.....	4	Erd	4-4 x6	Ker.	2-3
Dill... D	20	2380	4	Cont.	4-4½x5½	Gas.	3	Moline Orch.	9-18	1075	2	Own	4-3½x5	Gas.	2-3	Wellington F	16-30	.....	4	Chief	4-4½x6	Ker.	3-4
Dill... R.W.	20	2980	4	Midw.	4-4½x6	Gas.	3	Motor Macult.	1½	195	2	Own	1-2½x3½	Gas.	3-4	Western... 1920	16-30	2100	4	Clim.	4-5 x6½	Gas.	4
Do-it-All... A	3-6	595	4	Own	1-4½x5	Gas.	1	Motex...	15-30	2250	4	Buda	4-4½x6	Gas.	3-4	Westmore 21-22	12-25	1585	4	Own	2-5½x6½	Gas.	3-4
Eagle... F	12-22	.....	4	Own	2-7 x8	GorK	3	NE...	3-6	425	4	Own	2-3½x4	Gas.	1	Whitney... B	9-15	585	2	Own	2-5½x6½	Gas.	3-4
Eagle... AA	16-30	1445	4	Own	2-8 x8	G,K,D	4-5	Nichols-Shep. 20-42.	20-42	3100	4	Own	8 x10	G or K	3-6	Whitney... T	15-30	2000	4	Beav.	4-4½x6	G,K,D	2
E-B...	12-30	925	4	Own	4-4½x6	G,K,D	3	Nichols-Shep.	20-42	3100	4	Own	8 x10	G or K	3-6	Wisconsin... E	16-30	2250	4	Clim.	4-5 x6½	G or K	3
E-B... Q	16-32	2080	4	Own	4-5½x7	G,K,D	4	Nichols-Shep.	20-42	3100	4	Own	8 x10	G or K	3-6	Wisconsin... F	20-40	2450	4	Wauk.	4-5 x6½	G or K	4
E-B...	18-30	2009	4	Buda	4-4½x6	G,K	3	Nichols-Shep.	20-42	3100	4	Own	8 x10	G or K	3-6	Wisconsin... H	22-40	3200	4	Clim.	4-5½x7	G or K	4-6
Evans...	9-12	1525	4	Lye.	4-3½x5	Gas.	2	Nilson Senior...	25-50	3460	4	Own	9 x12	G or K	4-7	Yuba... 12-20	12-20	2600	2	Wisc.	4-4½x6½	G,K,D	3
Fagel... D	18-30	1885	4	Clim.	4-5 x6½	G,K	3-4	Oil Pull...	12-20	1485	4	Own	2-6 x8	K,D	3	Yuba... 15-25	15-25	3100	2	Wisc.	4-4½x6	G,K,D	4
Farm Horse. B	15-25	.....	4	Buda	4-4½x6	G,K,D	3-4	Oil Pull... H	16-30	2285	4	Own	2-7 x8½	K,D	4	Yuba... 20-35	20-35	4185	2	Wisc.	4-5½x7	G,K,D	4
Farquhar...	18-35	.....	4	Own	4-6 x8	G,K,D	4-5	Oil Pull... G	20-40	3175	4	Own	2-8 x10	K,D	5-6	Yuba... 25-40	25-40	4650	2	Wisc.	4-6½x7	G,K,D	4
Farquhar...	25-50	.....	4	Clim.	4-5 x6½	GorK	3-4	Oil Pull... E	30-60	4590	4	Own	2-10x12	K,D	8-10	Zelle...	12-25	.....	4	...	4-4½x5½	G or K	3
Fitch...	20-35	.....	4	Own	4-6½x7	Ker.	6-8	Oldamar GarK	2½-5	395	4	Own	1-5½x5½	Gas.	1								
Flour City...	20-35	.....	4	Own	4-6½x7	Ker.	6-8	Oliver...	A	15-30	.....	2	Beav.	4-4½x6	G or K	3-4							
Flour City...	30-50	.....	4	Own	4-7½x9	Ker.	8-10	Once Over Til-															
Flour City...	40-70	.....	4	Own	4-4½x6	G,K	2	ler Mark. 6-	12-25	3000	4	Strns	4-4½x6	Gas.	2								
Fordson...	395	.....	4	Own	4-5½x7½	G or K	4	Parrett...	K	15-30	1950	4	Pitt	4-4½x6	G,K	3							

COMING MOTOR EVENTS

AUTOMOBILE SHOWS

Poughkeepsie, N.Y.	Automobile Show	February
Kansas City	Kansas City Motor Dealers' Assn.	Feb. 11-18
Atlanta	Southern Automobile Show	Feb. 11-18
San Francisco	6th Annual Pacific Automobile Show	Feb. 11-18
Huntington, W. Va.	Automobile Show	Feb. 13-18
Utica, N. Y.	Motor Dealers' Show	Feb. 13-18
Wilkes-Barre, Pa.	Dealers' Assn.	Feb. 13-18
Galesburg, Ill.	Galesburg Auto. Dealers' Assn.	Feb. 14-18
Kalamazoo, Mich.	Mich. Automotive Trade Assn.	Feb. 14-18
Sandusky, O.	Automobile Show	Feb. 14-19
Cincinnati	Automobile Show	Feb. 15-20
Albany	Automobile Dealers' Assn.	Feb. 18-25
Ft. Wayne, Ind.	Automobile Show	Feb. 18-25
Hartford, Conn.	Hartford Automobile Dealers' Assn.	Feb. 18-25
St. Louis	Mfrs. and Dealers' Show	Feb. 18-25
San Jose, Calif.	Automobile Trade Assn.	Feb. 18-25
Salt Lake City	Automobile Show	Feb. 20-25
Duluth, Minn.	Automobile Show	Feb. 20-25
Dallas, Tex.	Automobile Show	Feb. 20-25
Bethlehem, Pa.	Automobile and Accessory Show	Feb. 20-25
Louisville, Ky.	14th Annual Automobile Show	Feb. 20-25
Syracuse	14th Annual Automobile Show	Feb. 20-25
Gr. Rapids, Mich.	Michigan Automotive Trade Assn.	Feb. 20-25
Norfolk, Va.	Automobile Show	Feb. 20-25
Deadwood, S. D.	Deadwood Business Club	Feb. 21-25
Ottumwa, Iowa	Automobile Show	Feb. 22-25
Clinton, Ia.	Automobile Show	Feb. 22-25
Trenton, N. J.	Car, Truck & Accessory Show	Feb. 22-25
Springfield, Ill.	Automobile Show	Feb. 23-25
Montreal	Automobile Show	Feb. 25-Mar. 4
Des Moines	Winter Automobile Show	Feb. 26-Mar. 3
Niagara Falls	Automobile Show	Feb. 27
Bethlehem, Pa.	Truck and Tractor Show	Feb. 27-28
Amsterdam, N. Y.	Automobile Show	Feb. 27-Mar. 4
Glen Falls, N. Y.	Automobile Show	Feb. 27-Mar. 4
Elmira, N. Y.	Elmira Automobile Club	Feb. 27-Mar. 4
Jamestown, N. Y.	Automobile Show	Feb. 27-Mar. 4
Muskegon, Mich.	Michigan Automotive Trade Assn.	Feb. 27-Mar. 4
Paterson, N. J.	Automobile Show	Feb. 27-Mar. 4
Portland, Ore.	Portland Dealers' Assn.	Feb. 27-Mar. 4
Springfield, Mass.	7th Annual Automobile Show	Feb. 27-Mar. 4
Windsor, Ont.	Automobile Show	Feb. 27-Mar. 4
Bay City, Mich.	Michigan Automotive Trade Assn.	Feb. 28-Mar. 4
Wichita, Kan.	Wichita Motor Trade Assn.	Feb. 28-Mar. 4
Harrisburg, Pa.	Automobile Show	March
Ardmore, Okla.	Ardmore Automobile Dealers' Assn.	March
Madison, Wis.	Four Lakes Bldg.	March
San Antonio	Automobile Trades Assn.	March
St. Louis	Manufacturers' and Dealers' Assn.	March
Evansville, Ind.	Eighth Annual Automobile Show	Mar. 1-4

ASHEVILLE SHOW IN MARCH

Asheville, N. C., Feb. 10—Members of the Asheville Automotive Trade Assn. will conduct an automobile show in this city March 2-4. A committee is working on plans, including the selection of location and rules and regulations governing entries.

More than 40 makes of motor cars and trucks will be on display at the second annual automobile show.

WINSTON-SALEM SHOW

Winston Salem, N. C., Feb. 10—A feature of the spring in this city and section will be the Winston-Salem automobile show.

Definite announcement is made that this event will be held in Pepper's warehouse, beginning Tuesday, April 11. The show will be open the remainder of the

week and also on Easter Monday, April 17.

Not only automobiles that are carried by local dealers will be presented in the show, but other makes as well. Dealers and others interested in the motor car industry will be here from all parts of North Carolina and from other states.

WAYNE TANK CONVENTION

Fort Wayne, Ind., Feb. 10—Salesmen and district managers of the Wayne Oil & Pump Co. in the central division of the United States will gather here on Feb. 13 and 14 for their annual convention. E. J. Gallmeyer, sales manager, and other officials of the company, have been holding similar conventions in other districts during the last several weeks. The convention to be held here this month will include salesmen and district managers in Indiana, Illinois, Michigan, Kentucky,

Asheville, N. C.	Automobile Show	Mar. 2-4
Youngstown	Youngstown Dealers' Assn.	Mar. 4-11
Brooklyn	Eleventh Annual Show	Mar. 4-11
Saginaw, Mich.	Michigan Automotive Trade Assn.	Mar. 6-10
Camden, N. J.	Automobile Trade Assn.	Mar. 6-11
Indianapolis	Annual Automobile Show	Mar. 6-11
Nashville	Nashville Automobile Trades Assn.	Mar. 6-11
Yonkers, N. Y.	Automobile Show	Mar. 6-11
Wilmington, Del.	Wilmington Trade Assn.	Mar. 6-13
Amarillo, Tex.	Automobile Show	Mar. 10-11
Antigo, Wis.	Automobile Show	Mar. 10-12
Denver	Denver Automobile Trade Assn.	Mar. 10-20
Boston	Annual Automobile Show	Mar. 11-18
Newark, N. J.	Newark Automobile Dealers' Assn.	Mar. 11-18
Spartanburg, S. C.	Piedmont Exposition	Mar. 13-18
Boston	Automobile Salon	Mar. 13-18
Omaha	Omaha Automobile Trade Assn.	Mar. 13-18
Great Falls, Mont.	Automobile Show	Mar. 13-18
Port Huron, Mich.	Michigan Automotive Trade Assn.	Mar. 15-18
Logansport, Ind.	Automobile Show	Mar. 16-18
Torrington, Conn.	Automobile Show	Mar. 20-25
White Plains, N.Y.	Automobile Show	Mar. 20-25
Ypsilanti, Mich.	Michigan Automotive Trade Assn.	Mar. 21-22
Denver, Colo.	Automobile Show	Mar. 22-25
Herkimer, N. Y.	Automobile Show	Mar. 23-25
Kingston, N. Y.	Automobile Show	Mar. 23-25
Ann Arbor, Mich.	Michigan Automotive Trade Assn.	Mar. 24-25
Wash'ton, City of	Automobile Trade Assn.	Mar. 25-Apr. 1
Jacksonville, Ill.	Automobile Show	Mar. 27
Oklahoma City	Automobile Show	Mar. 27-Apr. 1
Torrington, Conn.	Automobile Show	Mar. 27-Apr. 1
Ben. Harb., Mich.	Michigan Automotive Trade Assn.	Mar. 28-31
Quincy, Ill.	Automobile Show	Mar. 28-Apr. 1
Washington, D. C.	Automotive Trade Assn.	Mar. 29-Apr. 1
Bridgeport, N. J.	Automobile Show	Apr. 1-8
Bat. Creek, Mich.	Michigan Automotive Trade Assn.	Apr. 2-8
New York City	Electric Automobile Show	Apr. 3-15
Buffalo, N. Y.	Automobile Show	Apr. 10-15
Wins. Salem, N. C.	Automobile Show	Apr. 11-17
Chicago	Used Car Show	Apr. 26-May 4
Hartford, Conn.	Automobile Show	Sept. 4-9

FOREIGN SHOWS

London, England	Automobile Show	Feb. 6-11
Santiago, Cuba	Annual Automobile Show	March, 1922
Mexico City	Automobile Show	Apr. 16-23
Rio de Janeiro	Automotive Exhibition	Sept., 1922

CONVENTIONS

Wichita, Kans.	Threshermen's Convention	Feb. 21-24
Decatur, Ill.	3rd Annual Convention, Illinois Automotive Trade Assn.	Mar. 20

Ohio, West Virginia, Western Pennsylvania and western New York.

ILLINOIS TRADE CONVENTION

Decatur, Ill., Feb. 10—The third annual convention of the Illinois Automotive Trade Ass'n. will be held in this city March 20. Executive offices have been opened in the Lehmann building, Peoria. Ill. F. C. Zillman is manager.

SPARTANBURG SHOW IN MARCH

Spartanburg, S. C., Feb. 10.—One of the principal features of the Piedmont Exposition, to be held in Spartanburg March 13-18, will be an automobile show. This exposition is to be staged in the Billy Sunday tabernacle, which seats 5,000. It is being planned by the Industrial Engineering Corp. under the auspices of the Chamber of Commerce.